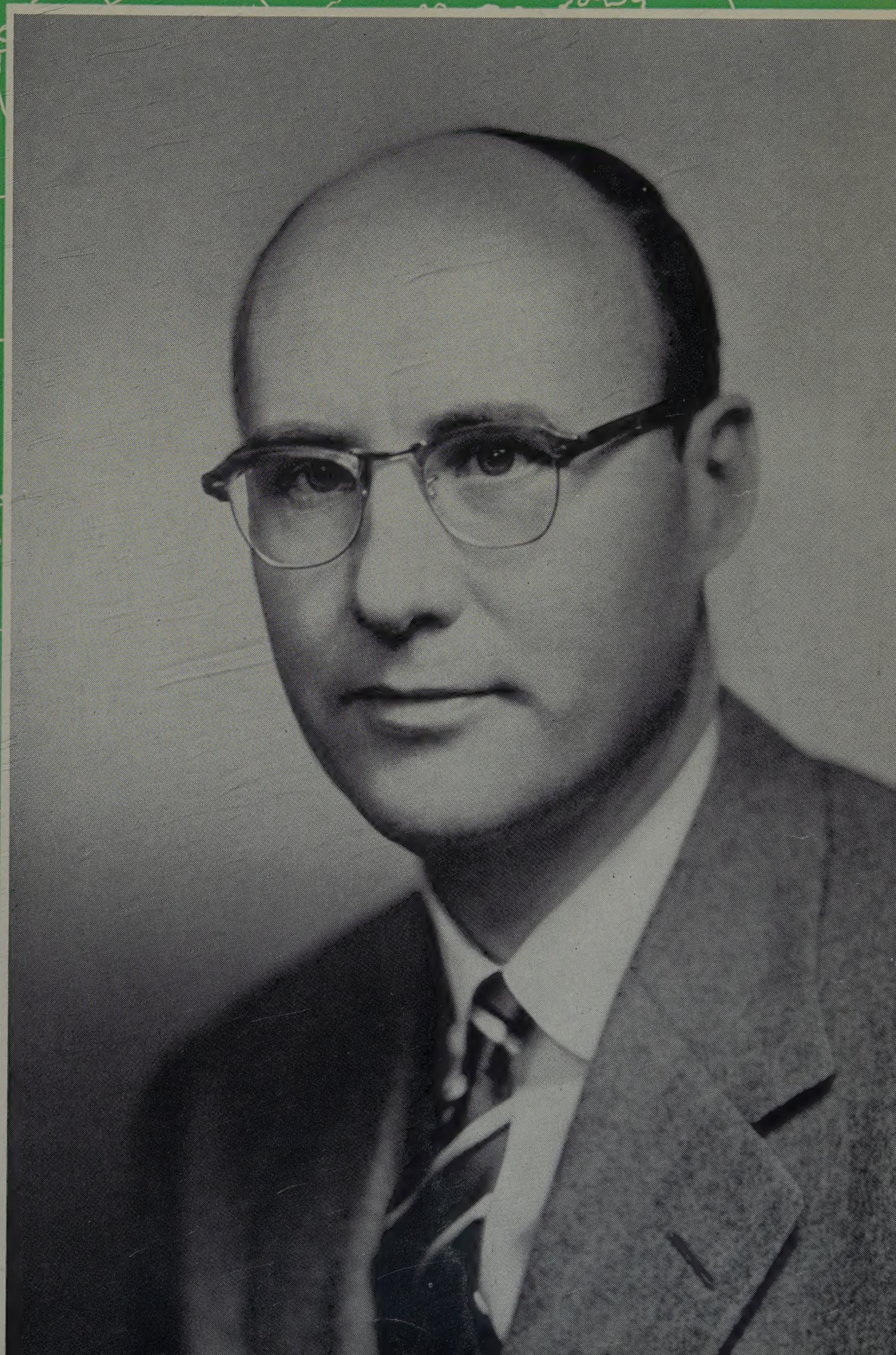
Illinois U. Library

Skyways

FOR BUSINESS

OFFICIAL PUBLICATION: NATIONAL BUSINESS AIRCRAFT ASSOCIATIO

8 159 12-57 K
THE UNIV OF ILL LIBR
CHICAGO UNDERGRADUATE DIV
NAVY PIER
CHICAGO 11 ILL



oseph B. Burns
resident, NBAA

•

he Mechanics of
e Landing Camera

•

as Your CAA
eemed Different
tely?

•

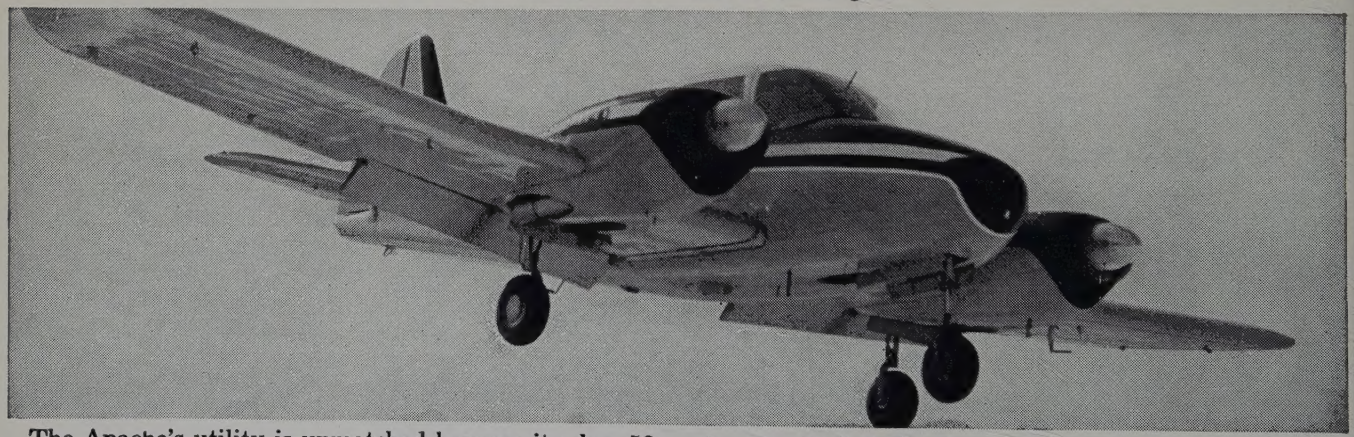
att & Whitney
nel

AY 1957

HERE'S WHY THE *Apache* OUTSELLS ALL OTHER TWINS

More Piper Apaches—nearly 1,000 of them—have gone into corporate service in the past three years than any other executive twin because the Apache combines all the advantages of round-the-clock, twin engine transportation with *economy* and superb comfort. Your choice of three cabin arrangements—standard four-place, four-place version with two reclining airline-type seats, or five-place version with five individual seats. Three attractive three-tone color combinations with matching interior are offered.

The Apache's performance and rugged stamina have been proved beyond question. 170 mph cruising speed, range up to 1,200 miles, good instrument flight characteristics. Proved by 25 routine transatlantic delivery flights, summer and winter, including one, non-stop 3,600 miles, New York to Paris. Powered with two 150 hp Lycomings, the finest executive plane engines available, the Apache has excellent single engine performance—fully loaded will maintain 6,750 feet on one engine.

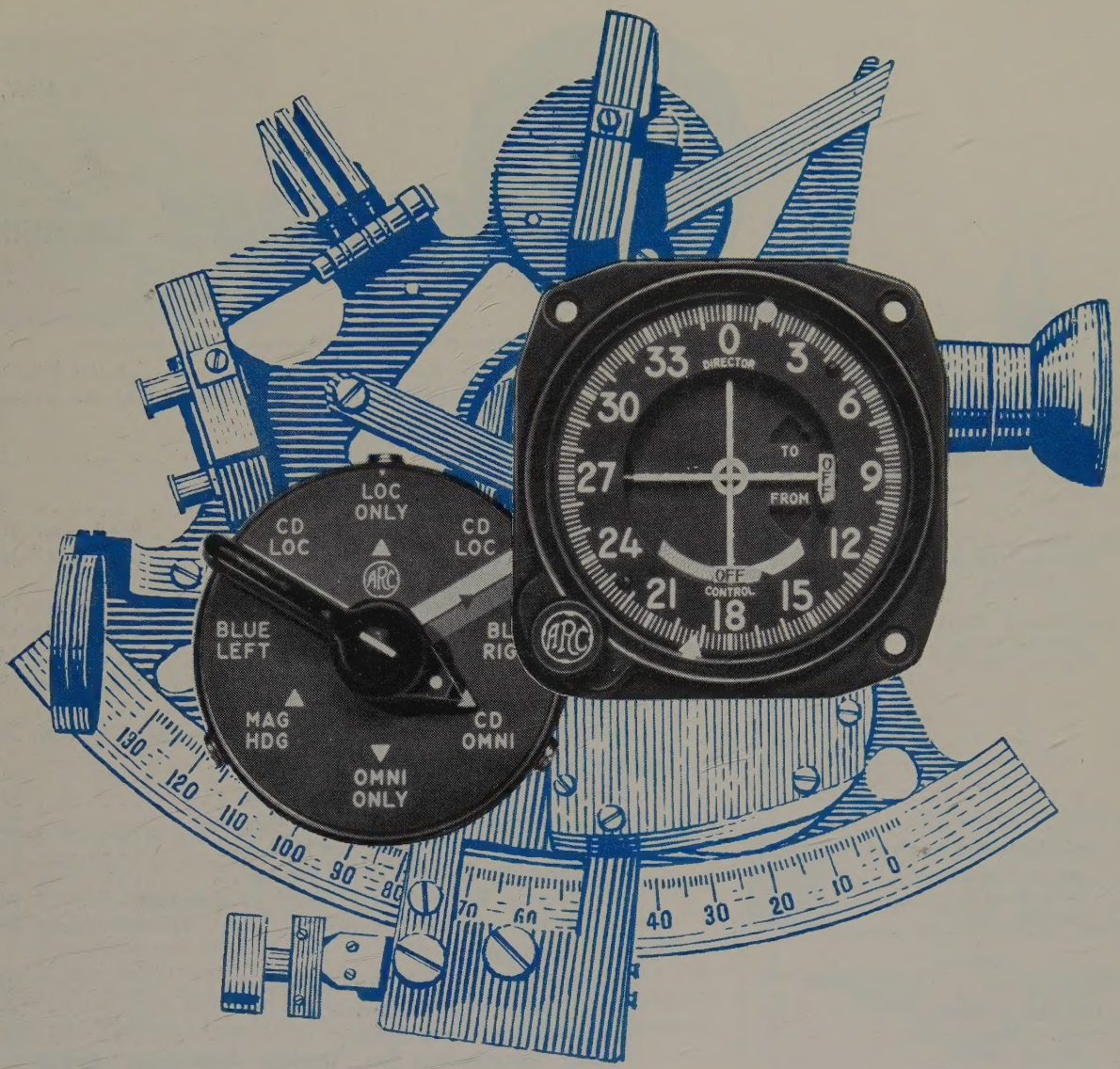


The Apache's utility is unmatched because its slow 52 mph stalling speed permits use of the smallest airports. Economically, too, the Apache is in a class by itself. Priced at half the cost of most available twins, the Apache has correspondingly lower depreciation, insurance and direct operating costs.

See your Piper dealer for a demonstration. You'll see it's good business to fly the Apache. For fully detailed catalog write Dept. K-5.

PIPER
AIRCRAFT CORPORATION
Lock Haven, Pennsylvania

MORE PEOPLE HAVE BOUGHT PIPERS THAN ANY OTHER PLANE IN THE WORLD



NEW LOOK in navigation aids

ARC's Course Director CD-1, Teamed with ARC's Dual VOR/ Localizer Receivers 15-D, Shares the Work with the Pilot

More and more pilots rely on the ARC CD-1 Course Director to determine the exact headings required to intercept and fly a desired VOR radial or runway localizer. This electronic "co-pilot" helps them fly with pinpoint precision, greater ease and increased safety, and in four simple steps.

With ARC's CD-1, the pilot selects his VOR or localizer station, sets his Course Director to the bearing of the desired VOR radial or localizer, turns his aircraft until the vertical needle of the cross-pointer meter is centered and steers to keep it centered. His ship will intercept the selected track quickly and smoothly, simultaneously compensating for wind drift. The pilot performs no mental computations, and there's no chance of overshooting the desired course.

This reliable navigational aid adds only 10 pounds to your aircraft. Ask your ARC dealer to install the CD-1, along with a *dual installation* of ARC's Type 15-D VOR/Localizer Equipment. You'll discover how easy flying VOR and Localizers can be — and with new peace of mind.

Dependable Airborne Electronic Equipment Since 1928

Aircraft Radio Corporation BOONTON, NEW JERSEY

Miniaturized Automatic Direction Finders
Omni/Loc Receivers • Course Directors • UHF and VHF Receivers and Transmitters • LF Receivers and Loop Direction Finders • 10-Channel Isolation Amplifiers • 8-Watt Audio Amplifiers • Interphone Amplifiers
Omnirange Signal Generators and Standard Course Checkers • 900-2100 Mc Signal Generators

Skyways FOR BUSINESS

The official publication of the National Business Aircraft Association

COVER: Joseph B. Burns, Pres. and Chairman of the Board, NBAA, is Labor Relations Counsel and Director of the Fuller Brush Company.

Air Your Views 6
Editorial
Youth and Tomorrow's Aviation 9
NBAA Director's Notes . . . . . Bill Lawton 10
Suite 344 . . . . . "C.M." 10
A Bearing Comparison Method of ADF Track Flying . . . . . Capt. O. B. Bivens 11
The Mechanics of the Landing Camera . . . . A. E. Jenks 14
Pratt & Whitney Panel 16
Has Your CAA Seemed Different Lately? . . Ralph Piper 18
TACAN Data Link and Automatic Position Reporting . . . . Capt. J. G. Bush 20
NAVICOM
Airborne Radar Beacon Program 22
New York ARTC Preferential Routes 23
Approach Light Contact at Newark 24
Portland, Ore., Jet Traffic Route 24
NL Aircraft Restrictions Lifted by Canada 24
Let's Get Rid of Cost-Per-Mile . . . . . Robert K. Polson 29
Safety Exchange
Further Details, ATC-TWA Dispute 30
West Coast Pilot Information 31
Airline Pilots Talk Safety 32
"ATR" Suspended for "Carrier Approach" Crash 34
In the Jump Seat . . . . . Torch Lewis 35
Maintenance 36
Now Hear This . . . . . 4 **In the Business Hangar** 40

FOUNDED BY J. FRED HENRY, 1942

EDITOR & PUBLISHER
LOIS HENRY

EDITORIAL ASSISTANT
George Watts

CONTRIBUTING EDITORS
Capt. Chuck Banfe—West Coast
Karl Hess—Fuels & Oils
Herbert O. Fisher—Flight Evaluations

BUSINESS & PRODUCTION MANAGER
Stanley M. Cook

READER SERVICE CIRCULATION
C. J. Johnson

ADVERTISING OFFICE, 122 E. 42nd St., New York 17, N.Y. Tel. MU 2-9138
MIDWEST—Richard P. McClanahan, 333 No. Michigan Ave., Chicago 1, Ill. Tel. DEarborn 2-0196
WEST COAST—Boyd B. Garrigan, 5478 Wilshire Blvd., Los Angeles 36, Cal. Tel. WE 8-4411

BPA
Member Business Publications Audit of Circulation, Inc.

VOLUME 16, NUMBER 5

SKYWAYS is published monthly by Henry Publishing Co., Emmett Street, Bristol, Conn.; Editorial and Executive Offices; 122 East 42nd Street, New York 17, N. Y. Printed in the U. S. A. Single copy; 50c. Subscription Prices. U. S. Possessions, Canada and Pan Am. Union, $9.00 for 3 years, $7.00 for 2 years, $4.00 for 1 year; all other countries add $1.50 per year for postage. Please give title, position and company connection when subscribing. Six weeks required for address changes (give both old and new). Manuscripts, drawings, other material must be accompanied by stamped, self-addressed envelope. SKYWAYS is not responsible for unsolicited materials. Accepted as controlled circulation publication at Bristol, Conn.

Copyright 1957 by Henry Publishing Company. The following publications are combined with SKYWAYS; Air News, Flying Sportsman and Airways Traveler. All rights to these names reserved by Henry Publishing Co.

The Board of Directors and the Executive Staff of the National Business Aircraft Association.

WILLIAM K. LAWTON
Executive Director
Secretary

RICHARD W. GROUX
Assistant to the Executive Director

•

BOARD OF DIRECTORS

President and Chairman of the Board
JOSEPH B. BURNS
Fuller Brush Co.
Hartford, Conn.

Treasurer
GERARD J. EGER
International Harvester Co.
Chicago, Illinois

HENRY W. BOGGESS
Sinclair Refining Co.
Tulsa, Oklahoma

JAMES KETNER, JR.
Texas Eastern Transmission
Shreveport, Louisiana

COLE H. MORROW
J. I. Case Company
Racine, Wisconsin

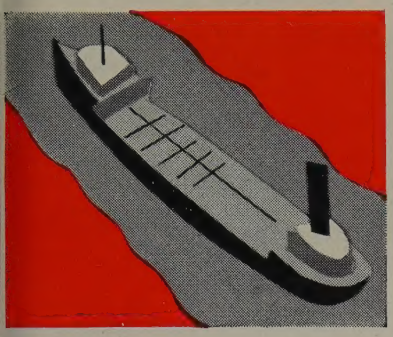
WALTER C. PAGUE
ARMCO Steel Corp.
Middletown, Ohio

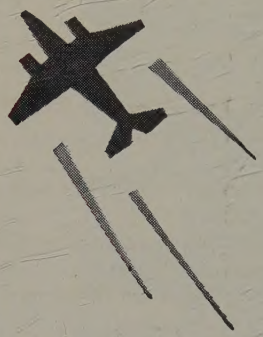
RALPH E. PIPER
Monsanto Chemical Co.
St. Louis, Mo.

E. T. SPETNAGEL
Wolfe Industries
Columbus, Ohio

ROBERT C. SPRAGUE, Jr.
Sprague Electric Company
North Adams, Massachusetts

CURT G. TALBOT
General Electric Company
Schenectady, New York

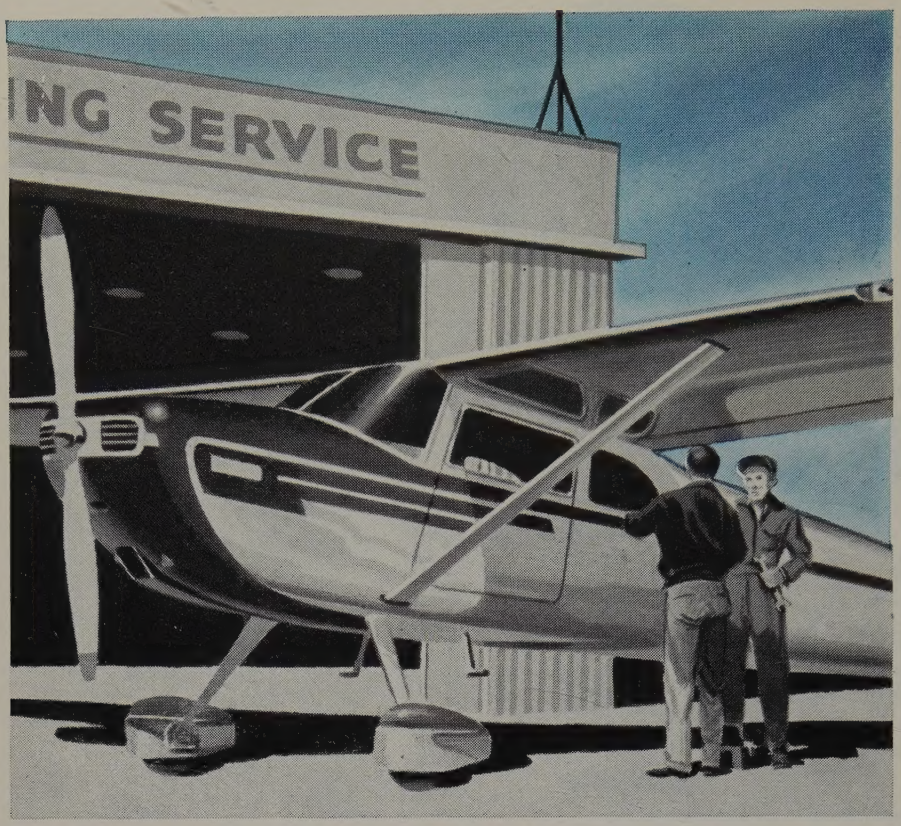




ST. LAWRENCE OR RIO GRANDE *Esso is there . . . at 600 airports from Maine to Texas!* Even business trips are pleasure trips — when you make a habit of putting down where there's an Esso Aviation Dealer. They're world-famous for their fine service (and, of course, for their fine Esso fuels and lubricants too!) And here's a smart tip: get an Esso Aviation Credit Card. It's your passport to charge-account convenience with *any* Esso Aviation Dealer. Lets you charge gasoline, oil and lubrication *plus* tire and battery service, landing fees, overnight in-transit storage and minor emergency repairs.

FREE TO PILOTS! For your free copy of "You and Instruments" by Col. Duckworth, packed with important information, be sure to see your nearest Esso Aviation Dealer.

Esso



Mr. Fixed-Base Operator:

REDUCE YOUR PARTS INVENTORY, INCREASE OPERATING EFFICIENCY . . .

by calling the Bendix Distributor nearest you!

The services of authorized distributors handling parts and units for Bendix* carburetion systems or landing gear equipment can mean a great deal to fixed-base operators.

For by buying through the nearest Bendix Distributor, fixed-base operators can reduce inventory—eliminate follow-up costs—economize on transportation—keep obsolescence at a minimum—reduce product deterioration, insurance, storage space and taxes.

Sounds like a lot to promise, but if you will get in touch with your nearest Bendix Distributor, he will be glad to demonstrate just how the program works.

*TRADE-MARK

Airwork Corporation
Miami, Florida

Airwork Corporation
Atlanta, Georgia

Airwork Corporation
Alexandria, Virginia

Aviation Electric, Ltd.
Montreal, Canada

Aviation Electric Pacific, Ltd.
Vancouver A.M.F., B.C.

W. J. Connell Company
Newton Upper Falls, Massachusetts

General Aircraft Supply Corporation
Detroit, Michigan

Pacific Airmotive Corporation
Burbank, California

Pacific Airmotive Corporation
Kansas City, Kansas

Pacific Airmotive Corporation
Oakland, California

Pacific Airmotive Corporation
Seattle, Washington

Reeve Alaska Airmotive
Anchorage, Alaska

Southwest Airmotive Company
Dallas, Texas

Southwest Airmotive Company
Rocky Mountain Division
Denver, Colorado

Standard Aircraft Equipment Co.
Mineola, L.I., New York

Van Dusen Aircraft Supplies
Minneapolis, Minnesota

Wheels, brakes and shock-absorbing struts. Carburetors, direct fuel injection systems and control systems for jet engines.

Bendix PRODUCTS DIVISION South Bend, Ind.

Bendix AVIATION CORPORATION

now hear this...

PERSONNEL

Paul T. Cullen was promoted to staff duty as ass't. to Pres. & Gen. Mgr. Carl G. Holschuh, Sperry Gyroscope Co., N.Y.

C. A. Degucz is Mgr. of the new Av. Battery Sls. Dept. of Electric Auto-Lite Co.

Paul J. MacKenzie is new Business Analyst and **Stephen F. Buck** new Dir. of Ground Ops. for Riddle Airlines. Buck was Admin. Asst. to Operations Mgr. of Riddle.

John W. Larsen is new Service Super. for Eclipse-Pioneer Div. of Bendix Av. Corp. for 7 western states.

Frank H. Sheldon was appointed Dir. of Contracts Sls., Slick Airways.

E. L. "Pete" Endsley was appointed Mgr. of Mfg. Control at Beech Aircraft.

Louis Achitoff was elected Vice Pres. —Operations of Flight Safety, Inc., N.Y.C.

Lloyd Gardiner joined the adv. staff of NBAA Member Sprague Elec. Co.

James F. Healey was appointed Chief of Plans & Programs for Aero. Div. of Mpls.—Honeywell Reg. Co.

Virgil Kauffman was elected Pres. of the Aero Club of Penna. Kauffman is Pres. of Aero Service Corp., aerial survey firm.

Carl B. Wooten was appointed Exec. V.P. of Trecker Aircraft Corp., mfrs. of the Royal Gull amphibian. Prior, Mr. Wooten was Sls. Mgr. for Aero Design & Engrg. **Earle W. Barry** is new V.P. of Latin American sls. of the Royal Gull.

Frazer Dougherty and **Donald V. Edwards** have joined the Customer Relations staff of Fairchild Engine & Airplane Corp. Mr. Dougherty will work with J. F. (Skeets) Coleman in the F-27 corporate sls. field; Mr. Edwards will work on customer relations in F-27 and M-185 fields.

Nate Milinarro is new Asst. Dir. of Ind. Relations at Bell Helicopter, Ft. Worth.

Charles M. Kearns, Jr., has been appointed Asst. Gen. Mgr., and **Wm. E. Diefenderfer** as Engrg. Mgr. of Hamilton-Standard Div. of United Aircraft.

Mark A. Steyaert has been named controller and **Dwaine H. Snodgrass** as Personnel Mgr. of Scientific Aeroproducts, Los Angeles.

D. E. Pederson is new Production Engr. for Axelson Av., Montebello, Cal.

Harvey N. Martin was appointed operational mgr. of The Norman Larson Co., Van Nuys, S. Cal. and S. Nev. Beech distributor.

Alexander D. Thomson was appointed Consultant to U.S. Dept. of Commerce, Advisor to Theodore Hardeen, Jr., Admin. of DATA, in agricultural flying, pipeline patrol and general use of civil planes for defense.

COMPANIES

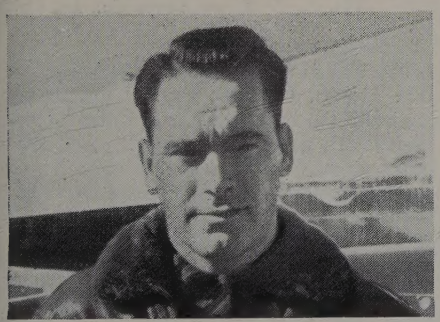
Cessna Aircraft has appointed Lloyd Av., Inc., Des Moines, as new Cessna distributor.

Los Angeles Airways, helicopter airline, and **Lewyt Corp., N.Y.,** were elected to membership in Radio Tech. Comm. for Aeronautics.

Eclipse-Pioneer Div. of Bendix has appointed Airwork Corp., Miami and Atlanta, as Southern Distributor.

Tomorrow's Business Twin Today—the luxurious 5-place Cessna 310

Business fleets get new flexibility, speed, economy with Cessna twins— 3 for the price of 1 converted transport



Pilots who have added Cessna 310s say:

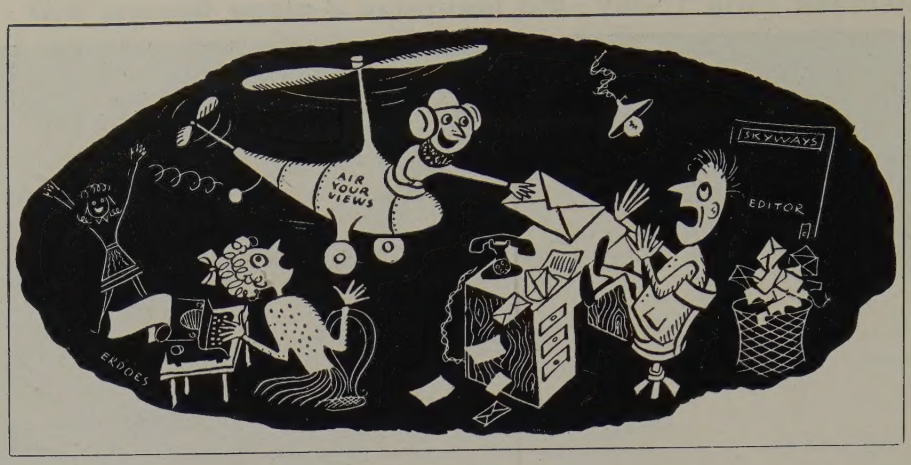
Ray Mabe, Oman Construction Co.: "The Cessna 310 is showing itself to be the 'in-between' ship we were looking for—spreads out our fleet by getting into fields where bigger planes can't go: in fact, lands and takes off shorter than many single-engine makes, yet has more power per pound of weight than any other business twin."

Jack Ollom, The J. R. Watkins Co.: "It's a fun trip whenever I take the 310 up. It's the fastest, most dependable new twin I've seen. And that luxury cabin makes some of our execs prefer it for all trips. We flew our 310, 125 days out of 168 work days, accumulating 97,211 passenger miles with 96% on-time arrivals during the last 8 months—at a very low cost per mile."

Richard W. Smith, Champion Paper and Fibre Co.: "I've always liked big transports. At the same time we need smaller planes for flights with fewer passengers. We bought our first 310 and found it suited our needs—as a result we now have a second one. 310s add flexibility to our fleet and their cost per passenger mile encourages their use." SEE YOUR CESSNA DEALER (Yellow Pages of phone book) or write CESSNA AIRCRAFT CO., DEPT. S-7, Wichita, Kansas.

Cessna® *Inquire about Cessna Lease Plans*

4 GREAT CESSNAS 172 180 182 310 **THE COMPLETE AIR FLEET FOR EVERY BUSINESS NEED**



AIR YOUR VIEWS

To the Editor:

With regard to your very interesting Round Table in the March issue of SKYWAYS on the Medical and Physical aspects of Safety in Flight, I would like to point out that it is because of careful routine physical examinations that pilots can fly safer and longer. Many of the ageing processes that could ground a pilot can be retarded to the extent that pilots can remain productive longer, if they are recognized earlier.

Many of the physical requirements now in effect could be relaxed considerably for the civil pilot; the rules for visual acuity are a good example of this.

Annual or semi-annual examination of the executive pilot would be a boon for him and his employer. It would also give the examining physician an excellent opportunity to keep a running story of the pilot's mental and physical health. It would help protect the pilot's job and his employer's life and investment.

One thing that was overlooked in the discussion was the health of the passenger of the executive aircraft. There are a few ailments that are distinct contraindications to flying. The medical consultant would be able to screen frequent users of aircraft and reduce liability of pilot and owner.

Research in the field of civil aviation should be done on an individual basis. Much can be gained by study of military findings with common-sense interpolation to civil flying. This would help Business Flying to its proper station in our economy.

The Flying Physicians Assn. has begun a preliminary study of the medical care of the executive pilot in an effort to determine what can be done to help solve this problem.

To the present time, physical condition has not been much of a factor in aircraft accidents only because the requirements have been such as to eliminate those who might have such accidents. Too much relaxation may tip the balance. Dr. Gentry offered an interesting point in that "pilot error" accidents could in many cases have been pilot physical error.

I am sure that the proper balance will be found, so that physical condition and medical consultation can find their place in civil aviation.

R. J. Vastine, Jr., M.D.

To the Editor:

As a steady cover-to-cover reader, may I ask why you withhold names in your very vital reports on violations, incidents affecting safety, etc.

When another pilot makes a pass at me, whether "head down and locked" airline boys or a novice "goof-off", I don't think he should be treated as an under-age juvenile delinquent and protected from public scorn.

Most of the pilots I know, especially the guys working at flying, get a lot out of SKYWAYS and I, for one, am glad that you include stuff for us smaller business pilots without talking down to us. It's a real working book.

Slightly bent throttle jockey.

Dear Jock:

Thanks for your comments. SKYWAYS is primarily written *by* working pilots *for* working pilots, and we are very much aware that the Business Fleet ranges from Convairs to Tri-Pacers.

About the use of names in controversial items, we do print names frequently when they are "in the public domain", and when, in our estimation, it would not prejudice the individual's rights or reputation to do so. However many such items are reported for their therapeutic safety effect, before "both sides" have been officially investigated. Also, if the incident was caused by one individual, we feel that a non-repeater is entitled to the second chance provided by anonymity.

The Editor

Herb Fisher, SKYWAYS

Scanning the pages of the Feb. 1957 issue of SKYWAYS I happened to run across your editorial on p. 6, "A National Civil Air Show".

This is a well written article and it is about time someone turns on the light for such an aviation show.

The interest in Civil Aviation is there. On Jan. 26-7 here at Ft. Lauderdale, Fla., I announced a very excellent Air Show that attracted thousands to the airport. However, such a planned National Civil Air Show must be properly planned and staged, and the time for such a show is ripe.

America is ready for such a show, and I will cooperate 100% in fulfilling this ambition. Bill Sweet, Mackey Airlines

To the Editor:

I was very much impressed with your editorial, "A National Civil Air Show?" It was a disappointing day when the armed forces took over our time- and tradition-honored "National Air Races". (As we who are "over 21" will always refer to it.)

The show at Phila. was the last I attended. You could see the death knell apparent there. It was no surprise to me when the announcement came out that National Air Shows were washed up. As you so clearly pointed out, civilians never expect to ride in a military jet. A personal interest in aviation consists of how *you* can be mixed up in it. Let the military have their aviation, but do not write off ours.

Keep plugging this idea, please! As more people become personally interested in aviation, the bigger this show, the races, get-together or whatever it will be called, can be. The fact that business flying is so big now, should help tremendously.

More power to you.

C. F. Hanna
Texas Co., La. Div.

To the Editor:

We had an unusual incident at Vermilion Co. Airport. I am the mgr. of the airport and also the base operator as owner of the Vercoa Air Service. We have 2 paved runways of 4000′ each and 100′ wide, 1 sod runway 2600′ long, an administration bldg., 2 main hangars and 30 T hangars.

One day my secretary looked out of the window and said, "We have a jet F100A out on the end of runway 35." I knew that they required more than a 4000′ runyay without obstructions for safe landing, from 8000′ to 10,000′, usually.

I started for the crash truck, but took a second look and saw the pilot walking around. I jumped into the jeep and went out. There was no external damage to the plane except the left main gear tire. The pilot, Capt. Harold Walsh, of E. Orange, N.J., stationed at Bunker Hill AFB, was very calm and collected considering the experience he had just had. He said, "I was checking out another jet pilot at 35,000′ when I developed engine trouble. I heard 5 or 6 rapid explosions, which I thought indicated a transmission stall. I nosed her down to pick up speed, and I

(Continued on page 52)

Editorial

YOUTH AND TOMORROW'S AVIATION

About the brightest shaft of light that has been focused on Aviation in a long, long time comes from the announcement made by Major General W. R. Agee.

General Agee is Commandant of the Civil Air Patrol. Before the Annual Meeting of NATA, the General disclosed plans to ask Congress for authority and funds to give fundamental pilot training to as many as 10,000 young men a year. The cost of such a training program would not exceed 5 million dollars annually or $500 per trainee. Training would be given by CAA approved fixed base operators and flight schools. In many respects the plan is similar to the ROTC flight orientation program and, like the ROTC program, has the endorsement of the Air Force.

General Agee seems to think that his program "has a tall mountain to climb." Evidently he seems to doubt favorable reception in Congress. His doubts may be well founded. If so, these doubts should not be construed as a reflection on the soundness of his program, the utter need for it, or the contribution it will assuredly make on the economic, political and defense strength of our Country. Rather, such doubts constitute a reflection upon the aviation industry and all of its proponents who have failed to awaken our citizens, including the Administration and Members of Congress, as to the full import that aviation is bound to have on the national and international affairs of tomorrow.

The 5 million dollar annual cost of a civil pilot training program should not be buried in our growing and rational desire to cut government spending. Congress and the Administration are rightly concerned about the Federal budget. All right thinking citizens agree with them in wanting tax reduction, a balanced budget, and a planned diminishing, eventually a wiping-out, of our staggering national indebtedness.

With our growing economy and our unprecedented efficient productivity, these goals can and should be accompanied by authorizing only *WISE* expenditures, by the elimination of appropriations which are highly doubtful to be productive of results beneficial to present and future national welfare and progress.

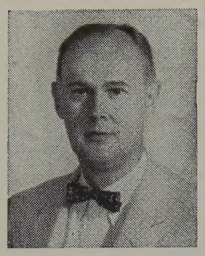
In considering justifiable Government expenditures, however, the vital importance of aviation should not be overlooked. If—one, five or ten decades from now—America is to remain a democracy, influencing the world in peace, freedom and prosperity, she *will do so more through the instrument of aviation than in any other single way!*

All of the world powers of by-gone-ages grew great, flourished and made their impact on civilization by leading their contemporaries in transportation. If it is certain that the sun shall rise and set tomorrow, then it is also certain that the commanding means of transportation tomorrow will not be by land or by sea—*it will be through the air ocean.*

Only the air ocean communicates with and touches every place on earth. Only through the air ocean can there be effective mastery over mankind's greatest impediments and obstacles: time and distance. Should America fail in being the master of the air ocean, she can expect to fail in protecting her shores, in stabilizing and in building her economy and in her golden opportunity to influence, if not to guide, the world in matters of freedom and of peace.

America has the demonstrated ability and capacity to conceive and to build the world's greatest flying machines. But, year by year, while she does it, she grows shorter and shorter of competent manpower qualified to understand and to skillfully fly them. Her pilot training program is not keeping pace with her technical aeronautical progress.

General Agee has put his finger on a national weakness: the growing shortage of qualified airmen. If all segments of aviation will back his plan and state their reasons for doing so to Members of Congress, the General may find that the "tall mountain" he sees in his path may be only a mole hill.



NBAA Director's Notes

● *Curtis Report* ready now for White House and Congressional action. Report provides a place in the air space for all users—dependent on pilot and aircraft capabilities.

All-Weather System provides for operations above certain specified altitudes and in dense terminal zones requiring control at all times. System will be extended to cover enroute altitudes designated to meet the demands and capabilities of the users wanting control protection at all times.

Dual-Weather System would operate under regulations similar to present rules . . . but using speed limits and minimum cockpit visibility standards. Air space assigned to these two different systems would *not* conflict. Each would have procedures and pilot proficiency requirements so chosen that each airspace user should be able to accomplish his desired trip when complying with the regulations of the mode that fits his capabilities.

● Lockheed's surprise announcement of a 4-jet utility transport trainer ready for first flight in Sept. will be watched closely by large companies contemplating entry into jet business flying field. According to specs transport is to carry 8 to 10 passengers at cruising speed over 500 mph.

● NBAA's in-flight evaluation of experimental runway lighting systems at Andrews AFB continues. Most promising system gives pilot runway lighting references so that he can establish and maintain constant, safe approach glide path to touchdown, without frequent check of cockpit instruments. Full-flood illumination of runway landing areas is next on flight-test program. Flight tests begin at 10:30 p.m. account jet traffic and continue on 'til the wee hours!

● How long will ATC "hold" me before landing or taking-off? Suggestion made by NBAA member to include information in simple, abbreviated form on Weather Bureau hourly teletype sequences now under examination by CAA.

Example: PHL M20 ⊕ 4R-K 132/58/56 7/933 . . . *030/120* would indicate 30 min. take-off delay, 120 min. expected ATC holding before approach time. Information would be available country-wide to ATCSS (formerly INSAC) radio stations for enroute fliers and at ATC Centers.

● Latest large aircraft to be considered for executive conversion is the C-46! This time the business C-46 will be T-Category and *pressurized!* Major conversion center chief engr. now completing plans for prototype production .

● Self-contained navigational systems . . . the latest military planning to unload onto civilian aviation.

Proposed now for long range navigational aid, the military would like to see their airborne heavy, expensive "black boxes"—ideal for their purposes—adopted as part of U.S. common navigational requirements for all aviation. With their ears still ringing over the TACAN controversy, military now using different tactics by "briefing" civilian aviation agencies in advance. This is quite different from the methods used in ramming home the secretly developed and high-cost TACAN, but the results could be the same.

● *SAFETY?* Did you realize that since 1946 there has been not one single passenger fatality in DC-3s engaged in business flying in the U.S? A real tribute is in order to the executive pilots, the maintenance crews and to management's safety policies. This record covers more than 10,000,000 mi!

● Commerce Dept. now studying airway user charges. Data collected in past months is being evaluated. Most likely proposal: Increased gas tax for civilian aviation; the military to pay their proportionate share with funds transferred from military budgets. Feeling is that tax on aviation fuels will be less costly than any other method to administer.

● *Question:* Will tax monies and military funds be earmarked for aviation's many needed improvements . . . or go to general fund? *Commerce* will check their proposed tax plans with aviation user groups before making any announcements.

Suite 344

Two more companies to add to NBAA's roster: Colorado Interstate Gas Co., Colorado Springs, Colo., owning and operating 4 multi-engine and 5 single-engine planes—Jim Ruble is NBAA Rep. and Chief Pilot; Hobart A. H. Cook Assoc., N.Y., owning and operating a Royal Gull amphibian—Hobart A. H. Cook, Pres., is NBAA's Rep. and C. J. Wellstead is Chief Pilot.

According to our records as of now, NBAA represents 707 multi-engine, 442 single-engine aircraft, 31 helicopters.

Earl Bauer, Ohio Oil Co. and Ralph Piper, Monsanto Chem. Co. are participating in the course for General Inspection to train inspectors to be of more aid to business pilots at the Oklahoma City Training Center. Ralph's report on the Oke City training center appears in this issue of SKYWAYS.

Mailings for the month of March: Complete revision of NBAA's Directory of Business Aircraft; Roster of Membership (by State); Memo on Restrictions lifted on NL aircraft admittance to Canada; Release on presentation of the comprehensive report on future requirements of general aviation from the GAFPG to Mr. Edward P. Curtis; Draft of minutes and attendance list of 9th Annual Meeting held in Miami.

Have you thought about a contestant for the Women's Aeronautical Assn. trophy for this year? As you know, this trophy is given at NBAA's Annual Meetings. You will receive your application and Rules and Regulations soon.

And, too, don't forget about "Miss Business Aviation, 1957". We hope to have Pat Walker, "Miss Business Aviation, 1956" to present the title this year in Denver.

Dick Groux, Asst. to Bill Lawton, has attended Airport Use Panel and Airspace Panel meetings all month in connection with the San Diego airport problem which is still seeking a suitable solution. Also an Ad Hoc Committee on self-contained aids for long distant navigation has been formed as a result of SWG-18.

Jerry Eger, NBAA's Treas., and Sec'y. for International Harvester was ordered to Fla. for a rest. What is the name of your doctor, Jerry? Here's hoping for a fast recovery.

Due to the pressure of work that Jeppesen & Co. found for Ken Skinner, "Corky" Douglass, Corbin Douglass Agency, found himself as Chairman of NBAA's Denver Arrangements Comm. for the 10th Annual Meeting.

It is our understanding that news on the Stratoport project will soon be released.

Wm. McGeorge and Wm. Noggle, Richmond, Va., visited us this month, showing a new self-contained, self-powered receiver transmittal unit. Bill Hotze, Reynolds Metal Co., and one of NBAA's first Board Members, will be one of the first to receive an order.

The meeting of the NBAA member representatives in N.Y., N.J. and Conn. area held a regional meeting in the Board Room of the Port of N.Y. Authority on Mar. 25 to discuss ATC problems in that area. The presentation by Herb Fisher on the airport development in the N.Y. area was very informative and successful, and we hope that similar types of meetings will be held. Understand a QB meeting followed.

The RTCA has invited NBAA to participate on a panel, composed of Air Space Users, at their Spring Meeting to be held in Los Angeles on May 7-8-9, on "Aviation Facilities Planning." Bill Lawton will attend that meeting, and at the same time meet with members of NBAA in Cal. to help them work on some of their problems with intentions of setting up a regional group.

The Minn. Business Pilots Assn. (MBPA), headed by Jim Magnus, Mpls.-Honeywell Reg. Co., is in the throes of a one-day forum to be held the latter part of May in Mpls.

We appreciate the time taken by so many of our members to visit National Headquarters. P. P. Parrish, Chance Vought Aircraft, Inc.; Ross Bennett and Johnny Rich, Sangamo Electric Co.; Wells Forbes, Scott Paper Co.; "Woody" Wood and Ed Dietzel, Gillette Co.; Leo Boyd and Ralph Bailey, Eastman Kodak Co. (Tennessee Div.) visited us this past month.

"C.M."

A Bearing Comparison Method of ADF Track Flying

By O. B. Bivens, *Capt., Eastern Air Lines, Inc.*

One of the greatest bugaboos of instrument flying seems to be DF tracking. Take the man who, 2 hrs. earlier at a previous station, bracketed the swinging leg of an old-style loop range with a 50 mph cross wind and made a perfect 400 and one approach, and now finds himself cleared for an ADF approach. He proceeds to wander over half the sky, cross the station at an angle of 40° to the desired track, turn madly in the general direction of the airport, and then miss what might have been an easy approach. Why? No system!

"But I got a system!" he snorts. "Last week I worked an ADF approach on this same place in the Link. I didn't get lost. I just remember that no matter what, when I turn the airplane to the desired track heading, the needle points in the direction of the track I want."

But a Link Trainer is a very responsive contraption, and when a heavy foot is applied to the rudder, the result is a rapid change in heading that couldn't be duplicated in a large airplane. When he straps all those engines and that flock of passengers to the seat of his pants, that big airplane just refuses to alter its course on the spur of the moment.

If you're an airline pilot or any pilot who does a lot of instrument flying, you probably already have a system of track flying. In any case, here's a neat little system that clicks. Try it in the Link or practice it as you fly:

Suppose you're flying west. You have the ADF tuned to a station somewhere up north of you. You continue west and leave the ADF tuned to this station. What happens to the relative bearings as you pass the station? Let's ask our pilot friend.

"That's simple, they increase. You might start out with a relative bearing of 45° or 50° and as you passed the station, the needle would swing through 90° and continue working its way around toward the tail. Numerically speaking, the relative bearings would be getting larger."

In the next question, the situation is the same, but the radio station to which your ADF is tuned is located south of you. You're still flying west. What happens to the relative bearings now?

"Elementary! They decrease. If you had a relative bearing of, say, 315° when you tuned the station in, the needle would travel counterclockwise through 270° as you passed abeam of the station."

100% correct! *Anytime we fly a straight course and pass a station on our right, the relative bearings on that station increase. Conversely, they decrease when we pass a station on our left.* This is a fact almost as simple and easy to remember as left and right, and just as basic. This is a rule we can use. Now, let's expand it a little.

If the magnetic bearing is nothing more than the sum of the magnetic heading and the relative bearing, it must follow that as long as the heading does not vary, the magnetic bearings will act exactly the same as the relative bearings when we pass a station. *They, too, will increase with the station on the right and decrease with it on the left.*

This, then will be our basic rule to remember *If the heading is constant, and you pass a station on your right, the bearings will increase. If you pass a station on your left, the bearings will decrease.* The application of this rule is simple.

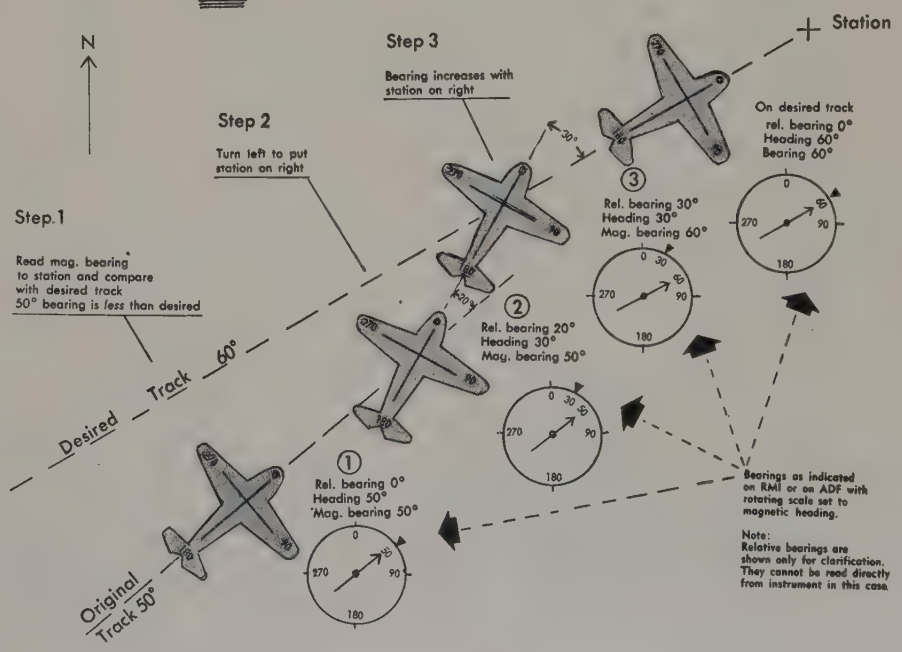
Consider your magnetic bearings at the moment as compared with the desired track. If your magnetic bearing is larger than the desired track, turn the airplane so that the station will be on your left. Your bearing will then decrease. *Bearings always decrease with the station on the left.* If your magnetic bearing is smaller than the desired track, turn the airplane so that the station is on your right. Your bearings will then increase. *Bearings always increase with the station on the right.*

Suppose your magnetic bearing on the station is 50°. Your desired track is 60°. Now which bearing is larger? Which way do you turn? *(Fig. 1)*

"Well, 60° is larger than 50°, so if my desired track is 60°, and I've got a bearing of 50°, I'll have to get the station on my right to increase that 50° to 60°. If I'm headed toward the station and make a left turn, the station will be on my right. Then the bearing will increase to 60°. That's simple enough, but what if I'm tracking *away* from the station? That's when I get mixed up."

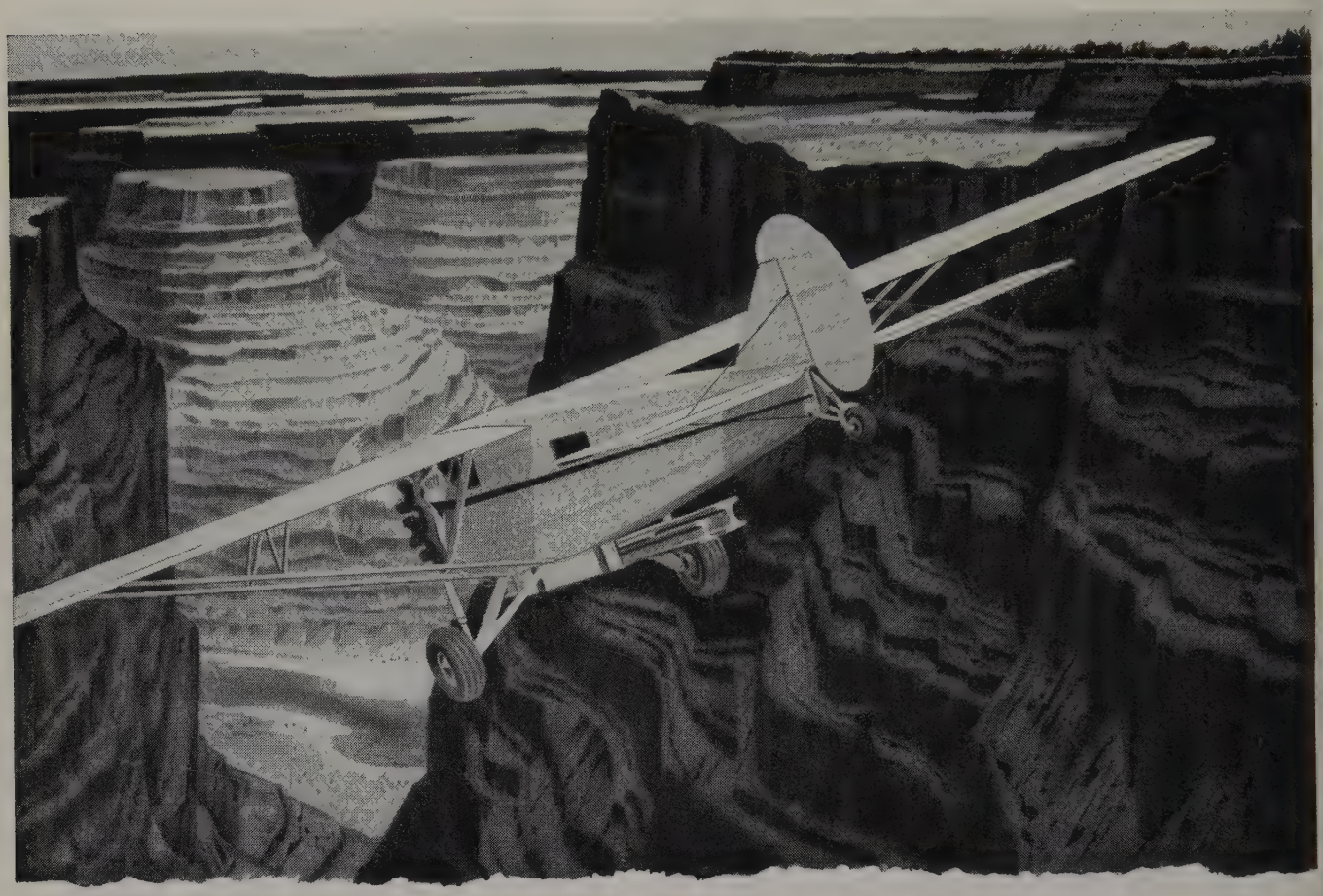
That's when *most* pilots get mixed up. But, if you bear in mind our cardinal rule, bearings increase with the station on the right and decrease with it on the left, you won't have any trouble. *This rule applies whether you're flying toward the station or away from it!* Suppose you're on a track of 50°

Fig. 1



PLANE FAX

by STANDARD OIL COMPANY OF CALIFORNIA



4000 feet straight down—with a ton of steel

Not a disaster — just one of almost 200 regular flights made by E. M. "Buzz" Westcott to the bottom of the Grand Canyon. Taking off from Kingman, Arizona, where he operates the Kingman Flying Service, he's ferried steel girders, motors, cables, supplies and construction crews to a tiny sand strip 4000 feet below the canyon rim.

"They're building a tramline to haul guano to the top of the rim, and I've had to fly in everything they need," says Mr. Westcott. "My old Travelaire is just the ticket for this kind of heavy hauling — as long as I have Chevron Aviation Gas in the tank. Even on broiling hot days its P&W 450 puts out full power on Chevron with never a miss. Chevron never fouls plugs, either — I know it'll get me where I'm going, and get me back.

"Of course, I take care of my engines. I overhaul at 1000 hours for safety's sake, but I always find RPM Aviation Oil has kept the engines near-perfect right up to the tear-down. 'RPM' holds engine compression at factory standards, keeps parts clean and free — I never have trouble with sticking rings or pre-ignition."

TIP OF THE MONTH

Bright-colored jackets and shirts sometimes cause reflections in the windshield, can cut night visibility. It's smart to wear dark clothes on night flights.

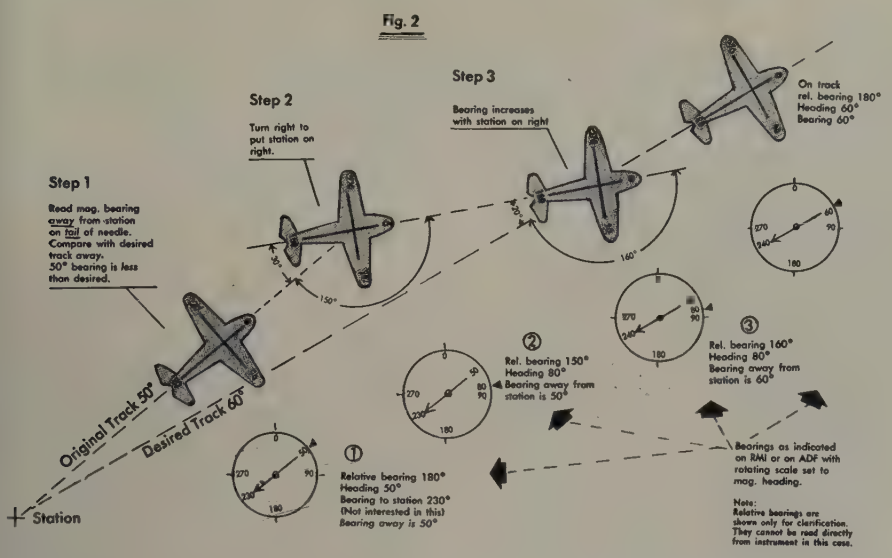
We take better care of your plane

CHEVRON AVIATION GASOLINE

AVIATION OILS RPM

T.M'S "RPM," "CHEVRON," "PLANE FAX," REG. U. S. PAT. OFF.

Fig. 2


Step 1
Read mag. bearing away from station on tail of needle. Compare with desired track away. 50° bearing is less than desired.
Step 2
Turn right to put station on right.
Step 3
Bearing increases with station on right
On track rel. bearing 180° Heading 60° Bearing 60°
Original Track 50°
Desired Track 60°
Station
① Relative bearing 180° Heading 50° Bearing to station 230° (Not interested in this) Bearing away is 50°
② Rel. bearing 150° Heading 80° Bearing away from station is 50°
③ Rel. bearing 160° Heading 80° Bearing away from station is 60°
Bearings as indicated on RMI or on ADF with rotating scale set to mag. heading.
Note: Relative bearings are shown only for clarification. They cannot be read directly from instrument in this case.

away from the station, and you want to fly a track of 60° away from the station. *(Fig. 2)*

If your ADF is equipped with an RMI (Radio Magnetic Indicator), the tail end of the needle points to your magnetic bearing *away from* the station, which in this case is 50°. (The head of the needle points toward the station, and indicates 230°.) If your ADF has that rotating scale which you can set manually to your heading, it too will read 50° on the tail of the needle, assuming you have the scale set to your compass heading. Our bearing away from the station is 50°, obviously less than our desired 60° track. To increase the bearing we know we must get that station on our right. Remember, your ADF always points toward the station regardless of your heading. *In tracking away from the station use the head of the needle to tell you which side the station is on. Use the tail of the needle to indicate the bearing away from the station.*

If, in this particular example, we begin with the airplane on a heading of 50°, the head of the needle points directly at the tail of the airplane. We note only that the station is directly behind. That's all we want from the head of the needle. The 50° at the tail of the needle tells us our present bearing *is too small.* What happens if we make a right turn of, say 30°?

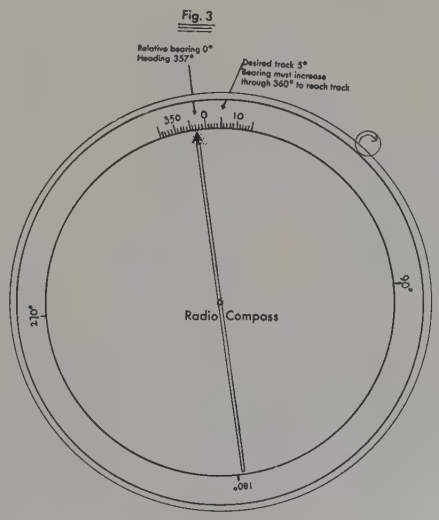
"That's easy! The ADF still points to the station which would now be on the right. I have an RMI on my airplane so I don't bother with relative bearings, but the station would be 30° to the right of the tail. My heading would be 80°, and the bearing away from the station, reading off the tail of the needle would be 50°, but would start to increase as I approached the desired track.

"I see what you're getting at now. By noting whether the bearing away from the station is *larger* or *smaller* than my desired track, I can tell immediately without having to turn the airplane parallel to the desired track, which way I'll have to turn to get on the track I want. Going away from the station, a right turn will put the station on my right and increase the bearings. A left turn will put the station on my left and decrease the bearings. But what happens when the wind starts to blow?"

Your bracketing for wind is the same with the ADF as with the range station. You just take a big enough slice at the desired track to allow for any wind that might be affecting you.

In the example we just ran through let's suppose we had a strong wind from the south which might have given us 15° drift to the left. When we turned to 80° to intercept our 60° track, we would have had 15° left drift. Therefore, our angle of interception would have been only 5°. With no wind, of course, the angle was 20° which would normally take us to the track with no trouble. If, after turning to 80° and flying that heading, we noted that the ADF needle was not progressing toward the desired track fast enough, we would immediately assume that we had a wind blowing us to the left, and would then turn still farther right to perhaps 90° or 95° to allow for this drift. This is exactly the same thing we'd do in flying a range. However, with the ADF we know *how many degrees* we are off the desired track. With the range we can only guess.

Fig. 3



With a north wind instead of a south wind we'd get perhaps 15° drift toward the desired track, and that added to the 20° turn we made would give us an interception angle of 35°.

Any time you turn the airplane to put the station on your right or left to increase or decrease the bearing, and the bearing stays the same, you are drifting. *Excessive* drift may even make the bearings *increase* when they apparently *should decrease,* or vice versa, but don't let this confuse you. Recognize it immediately for what it is and make a larger correction. *The ADF needle will always tell you what's going on because you are reading your magnetic bearing on it and comparing that bearing with the desired track.* Your ability to tell if your magnetic bearing is *larger* or *smaller* than the desired track certainly won't fail you.

"I see! You had me worried for a minute when you said excessive drift might make bearings behave backwards, but I can see that as long as you kept comparing your magnetic bearings with your desired track, you couldn't get mixed up! If the magnetic bearing was too big, for instance, you'd know you had to get the station on the left to decrease around the rose in a clockwise already on the left, but the bearing was not decreasing, you'd have to turn more and put the station closer to your wing tip in order to overcome the effect of the wind. Any more tricks to this system?"

Just one. Suppose you are on a heading of 357° to the station, and your desired track is 5°. With the station dead ahead (relative bearing 0°) which way would you turn to get on track? *(Fig. 3)*

"Those bearings are going to increase from 357° right on around to 5°! 360 is larger than 357. Zero and 360 are the same thing on a compass, and 5 is larger than zero! You'd turn left and put the station on your right so the bearings could increase."

Right! Your knowledge of the compass rose tells you that all bearings increase around the rose in a clockwise direction from zero to 360 and then start over again. Since only 8° separate 357° and 5° on the scale in a clockwise direction, 5° must be like 365°, or 8° larger than 357°. Just 8° clockwise you see your desired track of 5°. It's obvious at a glance that your magnetic bearing must *increase* to get 5°, because it will have to go through 360° first.

"Suppose I'm headed toward the station, and the check pilot says take up such and such a track *away* from the station. What's the easiest way to start this problem?"

In a case of this kind, the old system would probably be the simplest procedure to follow. Time would not likely be of essence, and since the track to be flown is away from the station, turning the airplane to the heading of the desired track would get you into a position to begin the problem. *With the airplane paralleling the desired track, the ADF would then point toward that track.* From this position you could

(Continued on page 38)

The Mechanics of the Landing Camera

The Operational Limitations of the Human Eye Relative to Landing Aircraft

By A. E. Jenks,
Chief Flight Inspection Division, CAA

There are many similarities between the eye and a camera; every camera has limitations and so does the eye. To understand these limitations, and to allow for their consideration in the design configuration of visual landing aids, is the purpose of this discussion.

The Parts

The human eye is almost spherical in its over-all aspect and consists of tough elastic membrane which encloses the lens, the iris, and the retina. The lens acts as a division or separation point between the front and rear portions of the eyeball, and is located about 1/5 of the eye's diameter from the front. The space between the lens and the forward part of the eye is filled with a clear liquid called *aqueous humor*. The space behind the lens is filled with a jelly-like substance called *vitreous humor*. These two liquids give the eye its required inflation to spherical form, and without them the eye would collapse. The rear inside portion of the eyeball is called the retina and it is here that the transformation of light waves into nerve pulses, which the brain can interpret as vision, takes place.

The lens and the iris, in effect, control the quality and amount of light transmitted to the retina.

The whole operation of focusing and directing the eye is controlled by six muscles arranged in such a manner that the eye can be moved up, down, right and left, and at the same time can be slightly expanded or contracted. The latter movements control with minute effectiveness the distance between the lens and the retina, which constitutes focus.

The operation of the lens and the iris have sufficient photographic comparison as to need no further explanation here, i.e., the same principles apply. The retina can be compared approximately to the photographic film. Actually, the retina is composed of ten layers of tissue, and in the deepest layers are located the tiny nerve ends, called rods and cones, that transmit the light impulses to the brain via the nerves or neurons. These rods and cones are protected by the layers of tissue except at one small spot near the center, called the *fovea*. The fovea is a small pit or depression about the size of the head of an ordinary straight pin. In this area the upper layers of retinal tissue are non-existent and the cones are exposed to light. The distribution and density of the cones and rods over the area of the retina is of extreme interest in the study of acuity throughout the visual field. In the foveal area itself, the cones predominate and the density ratio is approximately 160,000 per sq. mm.

In the remaining retinal area the light must penetrate the protective layers of tissue before reaching the cones and rods. This means that in the normal eye there is a central area of vision that is sharp and clear (*foveal vision*). Vision deteriorates rapidly in proportion to the angular departure from the center of foveal vision and this area is termed *parafoveal vision.*

The eye, in transmitting the visual picture to the brain, scans the area of attention by movement incurred by muscle actuation, simultaneously adjusting the eye focal length as required. Also, the entire retinal presentation, the combined output of all the cones and rods, is flashed to the brain via the optic nerve at rates varying from 40 to 150 times per second.

On the nasal side of retina is a point where the optic nerve enters the eyeball. This point of entry creates a small area that is devoid of cones and rods and is called the blind spot. Although the blind spot is on the nasal side of the eye, the area shows in the visual field at approximately 25-30° outward from the visual axis and slightly below the lateral centerline. This is due to the inversion of vision by the lens.

Whereas the foveal vision area is sharp and clear, the parafoveal vision is sensitive to change or motion. Colors are sensitive in parafoveal vision, possibly due to the difference in wave length compared with white light. To summarize, we can say that in a normal eye we have a small area of sharp, clear vision which represents 3-5% of the entire field of vision, and while looking straight ahead the area of clear vision is approximately centered in the visual field. Vision deteriorates rapidly in the remaining area to practically nothing at the extreme edge.

Binocular Vision and the "Computer"

So far we have only considered the function of a single eye. When consideration is given to the coordination and tracking of a pair of eyes, the complexity and accuracy of control far surpass any comparable electronic circuit.

In normal vision, the eyes track simultaneously, i.e., the visual axis of each eye is centered exactly on the focal point of the moment.

Another feature of the complexity of eye control and visual interpretation by the brain is the crossover network of the optic nerves. The optic nerve from each eye has 4 channels of which 2 from each eye go to the right side of the brain and the remaining 2 go to the left side of the brain. Each side of the brain has half of each eye's vision. The millions of nerve fibers involved fuse the images from each eye into the single image to which we are accustomed. The visual field of each eye overlaps sufficiently so that the visual field of one eye covers the blind spot of the other.

Vision is founded on education as much as anything else. Excellent examples of this are the case histories of otherwise normal individuals who have been blind since birth. In certain instances vision has been restored to these individuals by means of surgery. After the bandages are removed and the individual is exposed to the visual world for the first time, all is confusion: colors are meaningless, the definition of familiar objects by visual means is fruitless. When asked to identify visually the edge of a table or key from an assortment of objects, it cannot be done, yet when the individual's hand is placed on the edge of the table or allowed to hold a key, recognition is instantaneous. In a normal existence the visual education is progressive from birth.

Application to Landing Problem

If we apply the above to the approach and landing problem we can trace the evolution in this manner:

1. The average airline Captain of today has between 8,000 and 10,000 hrs. of flying experience.

2. He has made at least 8-10,000 landings, possibly many more; landing is not unfamiliar to him.

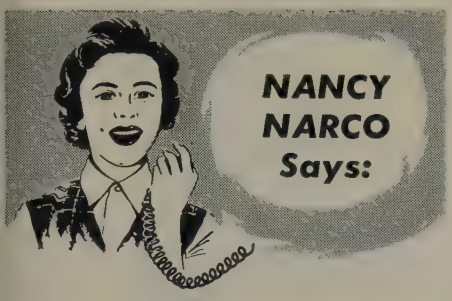
3. The greater portion have been made in daylight and reasonably good visibility, a lesser portion are at night where the familiar runway pattern is outlined by lights and the necessary ground plane texture picked up by the landing lights.

4. A very small percentage of the total number of landings are under poor visibility conditions either day or night.

Under the lowest visibility conditions we are requiring a pilot to act as the brain of a beast that requires a high order of visual judgment to effect safely the transit from air to ground.

Whereas, (again), it has been established that visual flight can be

(Continued on page 51)



Hello again,

HAVE YOU EVER been tooling along on a nice day with nothing to do but watch the check points go by—a little bored by it all? Well, if you want some entertainment, don't turn on the commercial broadcast music. Just flip your VHF receiver around the dial a couple of times until you latch on to a Center frequency, then listen to an Aircraft Control Center working the lads on IFR flight plan.

IT'S MORE FUN than reading other people's mail, and you get a lot out of it. You hear both sides of the conversation . . . there's an occasional foul-up on position reports ("ATC wants an explanation for your last estimate . . .") . . . and you can pick up heaps of good information. Sharpens up your own radio usage, and lets you realize those controllers aren't ogres but just nice guys doing their best to handle a difficult job—and with what patience!

A VISIT TO THE TOWER is very interesting, and educational, too. Next time you have some spare minutes, give the tower a call. Tell them you're a pilot and would like to look over their shoulders for a while. (Don't bother to bring all your aunts and nephews with you.) You'll learn a lot watching the Controllers at work and when you understand their end of this traffic control business it will help you immensely next time you're calling in for landing clearance. I've checked with CAA and they encourage tower visits by pilots—but please don't bother the boys when the weather's down and there's heavy IFR traffic. They're a little too busy to serve tea to visitors under those conditions.

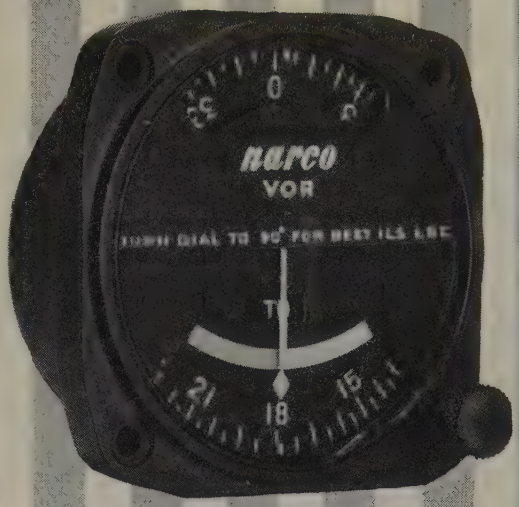
LAD FROM DES MOINES wrote in suggesting a little more courtesy on the part of us radio users. Said he was getting fed up with inconsiderate guys who tie up the range frequency just before a scheduled weather broadcast by filing a flight plan or asking for winds aloft all the way from Chicago to Seattle. Guess lots of us have been frustrated, too, when the ceiling's getting down and we're waiting for the latest weather only to have someone butting in at scheduled broadcast time. Unless it's really urgent, why don't we all lay off the mike for a few minutes before the weather broadcasts at 15 and 45 minutes after the hour, and let them get their broadcasts off on time? Some poor guy without a transmitter may be down there urgently waiting for the latest weather at Podunk.

See y'all next month,

Nancy

NARCO • Fort Washington, Pa.

ANNOUNCING THE NEW



narco VOA-3

A Precision Omninavigation System for Use with the

• NARCO SAPPHIRE 1016

• NARCO SIMPLEXER

Here's the Narco VOA-3—a completely new omninavigation instrument of extreme accuracy and reliability. It is designed specifically to add the Omni and ILS Localizer functions to the crystal-controlled VHF receiver section of the Narco Sapphire 1016, or the Narco 27-channel Simplexer, business aviation's most widely used VHF communications unit.

Designed to fit any standard instrument cut-out, the VOA-3 provides four-in-one presentation—"left-right", "to-from", selected course and reciprocal bearing. The VOA-3 is built to highest standards for dependable IFR use and has factory-certified accuracy of plus or minus 2 degrees.

The VOA-3 was made to order for aircraft already equipped with a basic omninavigation system and the 1016 or Simplexer for communications. By adding the compact, lightweight VOA-3 you gain the advantage of a second, highly accurate VOR/ILS Localizer system for added ease and safety in cross-country navigation.

TOTAL WEIGHT—FOUR POUNDS

VOA-3 indicator fits any standard 3⅛" instrument hole, is only 1¾" deep. Shock-mounted converter can be remotely installed, weighs 3.3 pounds. System is easily added to existing Sapphire 1016 or Simplexer units which have provisions for this installation.

See your Narco dealer or write for full details

narco

NATIONAL AERONAUTICAL CORP., FORT WASHINGTON, PA.

SKYWAYS FLIGHT OPERATIONS ROUND TABLE

Pratt & Whitney Panel

Substituted in this issue for the Regular Round Table

Chairman: Walter C. Pague, Chief Pilot, Armco Steel. Members of the Panel: Walter Cake, Operating Instructions Engrg., P&W; George Dickerson, Chief Inspector, Airport Overhaul Repair Dept., P&W; John D. Frazee, Technical Representative for the Service Dept., P&W.

Walter C. Pague *(Chairman):* "We are going to discuss the technical and practical field problems in the operation of the Pratt & Whitney engine series. Let's get started with some questions from the floor directed to these representatives of P.&W."

Smith: "There have been several assertions that the R2800 'B' series, that is—'dash 31' does not develop 2,000 hp at take-off. There are other conditions, of course, but I also understand that P&W rates their engines and I want to know how conservative that rating is, so that we normally arrive at less than 2,000 h.p."

Cake: "We are as conservative as anybody I know in rating engines. However, you get into odd differences as a result of the degree of engine supercharging you have available. The 2800B, to my knowledge, has plenty available, so that you can usually get your full take-off power without any difficulty.

"On the other hand, we have to build, test and rate these engines on the basis of test stand operation only. We cannot do it for an airplane because often we don't know what airplane the engine is going into. We send the data from our calibration to the C.A.A. and they have to read through our numbers, then send the engine to the airplane manufacturer.

"We will add things to it that will reduce the brake hp quite often. Some of them, such as a generator and a cabin supercharger, you don't have on the 'B' series 2800. But the chief absorber of power is usually the exhaust system on these 2800 engines. We have measured from about 40 hp absorbed by the exhaust system, to around 125 hp, depending upon which exhaust system it is.

"When you put this engine in the airplane and run it at 52" of manifold pressure, 2700 rpm, the exhaust system has squeezed down that outlet hole to the point where all the air doesn't get into the engine. You don't get enough air to develop the rated horse power. If you have a 2,000 hp rating, you might easily get only 1950. That isn't the engine's fault; it is simply because the exhaust system restricts the air flow through the engine."

Smith: "Would the exhaust system restriction of air flow intake affect the amount of supercharging?"

Cake: "No, an aircraft engine is just an air pump; whether you restrict the intake or the exhaust it has the same *end* effect."

Smith: "When we are making our run-up on the end of the runway, how can we determine whether the engine is, so to speak, sick or tired?"

Cake: "You cannot really check the full horse power of the engine. You can check its general condition, at the field barometric pressure, however, and if it is operating there satisfactorily, it should be operating all right on take-off.

"The airplane that you have was certificated with that power loss built into it. The rpm varies with the installation, but normally it is between

(Continued on page 44)

PANEL *members (left to right): George Dickerson, John Frazee, and Walter Cake. Far right, Chairman Walter C. Pague.*

The '57 Beechcraft Twin-Bonanza offers more payload, carries more cargo, has greater range, gives better performance, has more visibility, more passenger comfort, is more quiet, has more safety features, a better safety record, comes more completely equipped, has higher resale value than any other airplane in its class!

Ask about Beechcraft's complete financing programs. Your Beechcraft distributor or dealer will provide complete information, or write
Beech Aircraft Corporation
Wichita 1, Kansas

Beechcraft

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS

Has your CAA seemed different lately?

In the Feb. issue of SKYWAYS there was a DC-3 panel discussion which was conducted in Miami during the 1956 NBAA Annual Meeting and Forum. If you read that report, you noticed that Buril Barclay of the CAA referred to a course which had been added at the CAA Aeronautical Training Center at Oklahoma City. It is designed, as Mr. Barclay stated, to train specialists in the CAA to be of greater service to the business pilot.

Partially as a result of the DC-3 panel, partially as a result of many years of working with Mr. Barclay in connection with NBAA and CAA affiliations, I was given the opportunity to spend 2 weeks in the Training Center observing the 2nd run of the new course. The CAA course is not confined exclusively to the flying characteristics of the DC-3 but is a course to train CAA personnel to assist the business pilot regardless of the aircraft he may be flying.

I was particularly impressed with the attitude of all instructors engaged in presenting this course. Their diplomatic presentation can only be reflected in their trainees. In turn, the business pilot will find a CAA representative willing and eager to help him. This is a far cry from the reputation the CAA had 15 or more years ago.

Trainees for the business flying specialist course are CAA General Operations Inspectors selected primarily on the basis of their diversified experience and background.

Earl Bauer of Ohio Oil Co., Findlay, O., and I were invited to attend the Mar. 4 course as observers from the business field. The 4 inspectors or trainees assigned came from each of CAA's 4 continental regions. A 3rd course was set up for Apr. 1, and more are planned after July 1. Each region will have from 2 to 5 business flying specialists.

The course consisted of lectures on instrument procedures, omni holding, methods of flying the ILS. Link trainer instructors were Gordon Post and Bob Jacobs, weight and balance by the man who practically originated the idea, Dave Baker, who was a corporation pilot in the late 20's and early 30's. ATC procedures, cross-country clearances, information manual, etc., are taught by a former navigator for TWA, Guy Arnold, the DC-3 Manual—T Category—and flight, by Tom Dye, an ex-Navy Commander in the Naval Air Force. Flight characteristics and performance, Ken Archer.

Some time was spent in the Boeing Stratacruiser Dehmel Trainer, a jet simulator, and a tour of the power plant section—Hope Biggers' Museum.

There were many bits of information accumulated during the 2 weeks that Earl Bauer and I observed of the 3 weeks course, all of which would be worthwhile for any business pilot. Time and space prevent even an attempt to tell you what all we obtained from just observing.

There are now specially trained men in your region who are qualified, willing and happy to assist you, free of charge, in almost any problem that you may have regarding your operation. He is capable of showing you exactly how to set up a weight and balance schedule on your particular airplane, and how to find out how many feet of runway your airplane will need, given altitude, temperature, load, and still clear a 50′ obstacle, or, in case of engine failure before take-off, come to a complete stop. He can give you tips on how to better execute a procedure turn. He can tell you why your DC-3 is not a T Category aircraft and never will be. He can prove to you, beyond a shadow of a doubt, why there is only one recommended type of take-off or approach for your particular type of aircraft. You will want to know about some of these things, unless you already know all there is to know about the performance of your plane.

This course obviously is not a "cure-all" for business plane accidents. Many things are yet to be learned and passed on to those in the field. This course, however, is a giant step in the right direction and certainly eliminates some of the chances we may have been taking in the past unknowingly.

There are still unpleasant memories among some pilots and operators of the old days of check riders, inspectors, filed violations, etc. But the time is here when your Flight Department can call on this government agency and get help immediately in maintaining your proficiency or in improving your department. But you may have to call and ask for this information or ask for a man or a team of specialists to come and inspect your operation.

Summarizing the course, it is easy to state that never has so much been accomplished in so little time and so effortlessly. Impressive things to us were new instrument techniques, new tips on flying the Omni, new ideas on flying the localizer and glide path, easier methods of figuring weight and balance, new concepts of engine-out performance, drastic demonstrations of what a DC-3 will not do on one engine at 26,200 lb. at altitudes above 1,300′.

Earl Bauer and I are convinced there have been no wasted funds on this course. No better investment of corporation tax money can be made than to avail yourself of the meat from this course. Many of you may find that your facilities are such that it will be impossible to participate in your own training program. Therefore, to meet the standards set up in a suggested training program you may want to avail yourself of professional help such as the various business or airline training schools that are now in existence. The material taught in their schools is similar to the information your CAA representative has.

Other courses during the coming year are on the schedule at the CAA Aeronautical Center, Oklahoma City. Other business pilots will be invited to attend and observe the course in action. I hope that you are one of those who will be able to attend the course as an observer or call one of the business flying specialists in your region. +++

$10 Million Center to House CAA Jet Age Activities

Ground has been broken for a brand-new Aeronautical Center at Oklahoma City, where CAA will concentrate its training, warehousing and shops to meet the jet age.

The new Center is being built in anticipation of the "tremendous growth that lies ahead for every aspect of the industry." In his address at the ground-breaking ceremonies, Louis S. Rothschild, Under Secretary of Commerce for Transportation said that "the Aeronautical Center plays a vital role in carrying out the ambitious program which we are undertaking to provide for safe aviation activity in our country, the growth of which is forecast to triple by 1965." James T. Pyle, Civil Aeronautics Administrator, observed, "We face an increase in training of our safety inspectors, communicators and air traffic controllers, airways technicians and flight check crews. Efficiency requires a concentration of materials and shops, and all these things will be made possible at the new center Oklahoma City is providing for us."

Operations at the Center will feature expanded training in jet planes and in the field of new electronic aids for airways. CAA flight check crews, using new aircraft flying the high altitudes to be frequented by jet transports, will be trained and given refresher courses at Oke City. Two jet bombers and 5 Convair transports will be based there in addition to the 2 DC-3's now at the Center. Eleven 5-man crews will be trained to use the Convairs in the recently developed "grid system" of navaids checks, which includes use of electronic computers.

CAA safety inspectors will receive jet familiarization training in a T-33 and two F-80 Air Force jets in preparation for the business jet age.

Warehousing of the many items required for equipping the airways will be an important aspect of the new Center, where a new building with 15 acres of floor space will hold equipment before distribution.

Shops now located at CAA's 4 con-

tinental regional offices will be moved to the new Center for concentration.

Training of communicators and air traffic controllers will continue to be a vital function of the Center. For fiscal '57, about 1400 newly employed traffic control personnel will be trained at the center, and it is anticipated that training demands on the Center will increase more than 70% the following year. Even this, however, will not fill CAA requirements.

Finally, the Center will continue to train foreign nationals for the International Cooperation Admin., State Dept. and ICAO, working toward the goal of international standardization of policies, methods and equipment.

New buildings, to replace the left-over WW II metal barracks, will be completed progressively between May '57 and Jan. 1, '58, and the CAA will begin paying the city rent of $848,000 a year on Jul. 1, '58. After 25 yrs., during which the city will retire its original investment of $10,665,000, the rent will drop to $380,000 a year upon renewal of the lease.

CAB Revises Accident Hearing Rules

Certain revisions in its accident investigation hearing rules have been announced by CAB Chairman James R. Durfee. The new procedures, used for the first time in a hearing in Tulsa on Feb. 27, will be used in accident hearings in N.Y.C. and Los Angeles. The Tulsa hearing dealt with an AAL Convair crash on instrument approach. The N.Y.C. hearing will deal with the NEA DC-6A instrument take-off crash, and the Los Angeles hearing with the Douglas DC-7 and Northrop fighter collision.

The revised procedures provide for participation by officially designated "parties to the investigation" who will be permitted to question witnesses at the public hearing. These will normally include those persons, government agencies and companies and associations whose employees, functions, activities or products were involved in the accident, or investigation.

The new procedures also include use of the prehearing conference technique, the purpose of which is to limit and define the issues and to set the scope of the hearing. The designated "parties to the investigation" will be permitted, pursuant to arrangements made at the prehearing conference, to question witnesses at the hearing.

The Board also authorized its Office of General Counsel to act as legal consultant to accident hearing panels.

The Board emphasized that it is not trying to follow courtroom rules. Its accident hearings will remain informal and factfinding, and are not of an adversary nature. These inquiries are held to seek probable causes of accidents, not to determine the rights or liabilities of private parties. The Board added that it was of the opinion that by permitting the questioning of witnesses by "parties to the investigation," in accordance with these newly adopted rules, it will be possible to develop a more complete factual record.

The McCauley Met-L-Prop Fixed-Pitch Propeller is available for Tri-Pacers, Pacers and Super Cubs.

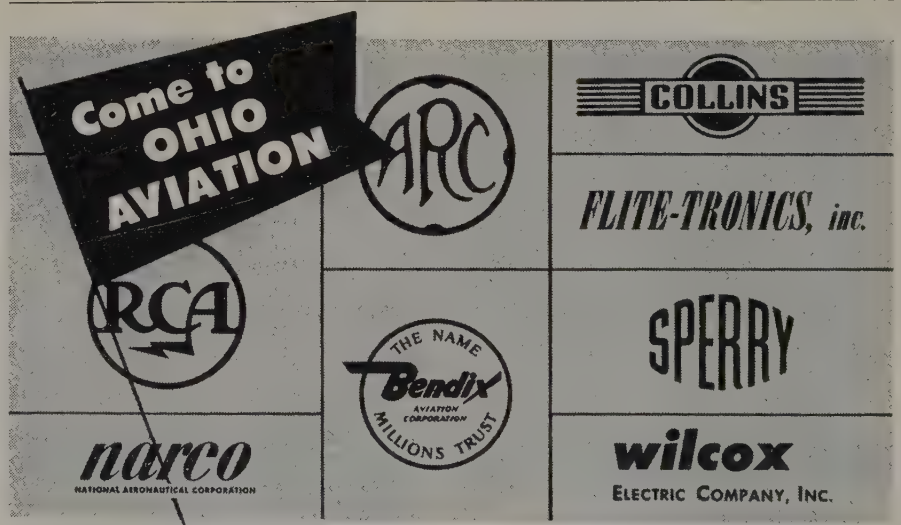
Met-L-Props (in a new "GM" series) now are approved for Lycoming engines of 125 HP, 135 HP and 150 HP used in Piper aircraft. Made of forged, heat-treated aluminum alloy, Met-L-Props are anodized for complete protection. They are designed to assure quicker take-offs, faster climbs, smoother cruising! More than 50,000 Met-L-Props have been made and sold ... are tops in durability ... performance ... speed ... safety. No tip failure has *ever* been reported!

Met-L-Props are easily installed ... need no adjustment ... require no maintenance ... offer longer propeller life ... are lower in overall cost! If you fly a Piper PA18, 18A, 20 or 22, you'll fly better behind a McCauley.

See your McCauley Distributor or Dealer, or Airport Operator for your new Met-L-Prop today!

McCAULEY INDUSTRIAL CORPORATION
1840 HOWELL AVE.
DAYTON 7, OHIO

"World's largest manufacturer of metal propellers for personal and business aircraft."



For installation and service on these famous makes

As a business or private plane owner you have 2 basic instrument requirements.

1. Reliable equipment
2. Expert installation and maintenance service

Both are yours at Ohio Aviation. As distributors for the finest radar, navigation and communications equipment made, Ohio Aviation technicians have established a nationwide reputation of ability to plan, fabricate, install and maintain equipment. Here equipment is quickly and expertly prefabricated to your specifications. Preplanning cuts down installation time and reduces the loss in valuable flying hours.

For these reasons hundreds of operators automatically return to Ohio Aviation for new equipment and service.

Why not check with Ohio Aviation on your next requirement? Wire or phone Fred Aubry at Vandalia, MO 4-4646.

THE OHIO AVIATION CO.
Dayton Municipal Airport,
Vandalia, Ohio

TACAN DATA LINK and Automatic Position Reporting

By Capt. J. G. Bush

Over twenty years ago the writer had the opportunity at old Hoover Airport, Washington, D. C., to observe one of the first serious efforts to provide enroute air traffic control service. In a small room under the airport tower, a few men stood around a table on which lay a composite map of the area and most-used air routes in a 150-200 mi. radius of Washington. A couple of telephones, an early version teletype printer and a small inclined blackboard completed the equipment.

As the phones rang, very occasionally, a man would answer "Washington Control," talk for a few brief minutes while he moved a small marker on the map table and made a notation on the board. This action completed, the phones (usually from airline operations offices) might not ring again for some time. This then was ATC in the middle 1930's, basically a man getting and giving information over a phone, making notes and tracking the progress of an aircraft along the airways. How has it changed since? Today, in the smallest or busiest center, traffic controllers are still answering phones or a radio, receiving and giving flight progress reports and instructions, following many more airplanes in a much more crowded airway system.

More radio, with direct air-ground contact to pilots has reduced the time delay and overall action involved, or today's traffic could not move even as it does, at and past saturation. Radar has made the action more prompt and accurate, safeguarding as well as transferring much of the information-gathering to the visual rather than the aural senses. But basically, the communications and the clerical workload are still the largest proportion of the ATC job.

In the very near future several systems for automatic display, recording, classifying, computing and eventually directing these actions are going to vie for the job of freeing the controller from these time- and energy-consuming details and allow him to concentrate his highly skilled efforts where they belong, in directing the flow of traffic. One of these is the Federal Telecommunication Laboratories *TACAN Data Link*. With the decision last year to go to TACAN for the Distance Measuring portion of the air navigation Common System, the significance of the Data Link as proposed by FTL warrants examination.

An aircraft, with the TACAN Data Link unit added to its TACAN or VORTAC set, automatically reports position, altitude, course, and speed to the TACAN Data Link terminal co-located with the VORTAC station to which it is tuned. Thus, TACAN Data Link offers to the air traffic controller an indispensable tool for performing his mission. Reports are transmitted automatically from the aircraft's instruments at regular intervals and at a high rate. Consequently, the aircraft position made available to the controller is up to date and accurate to a fraction of a mile. The other reported information is similarly accurate and current.

While providing these services to the controller, use of TACAN Data Link frees the pilot of the responsibility for making voice radio position reports. It also frees the over-crowded voice radio channels from the heavy load of routine reporting, leaving them free for other operational transmissions.

In addition to furnishing automatic reports, TACAN Data Link may be used for transmitting clearances or commands from the Air Traffic Control center to individually addressed aircraft. These messages have the same accuracy and up-to-date character as the automatic position reports. By using this feature, a controller can automatically transmit, and have displayed to the pilot, a full set of navigational orders, including ordered position, altitude, course, and speed. Routine traffic control procedural messages such as "Let down 1000," "Hold," etc., can be transmitted and displayed to the pilot.

Thus, without the use of voice radio channels, without the addition of more radio spectrum, and without the readability problems encountered in aural air-ground reception, substantially all the communications necessary for orderly traffic control can be accomplished. (*Fig. 1*)

In less than 3 sec., on any of the 126 TACAN channels, 120 aircraft can be serviced. To each aircraft, individual orders of bearing, distance, heading, altitude and speed can be transmitted, in addition to 31 on/off messages such as "Hold," "Proceed," etc. This information can be generated either automatically, by computers, or manually via suitable control positions. At the same time, each of the 120 aircraft automatically encodes a full report including its bearing and distance from the VORTAC beacon, its heading, altitude, and speed, and any of 31 individual pilot-originated messages. This data is passed to computers for automatic processing, and to displays for monitoring and/or manual control. (*Fig. 2*)

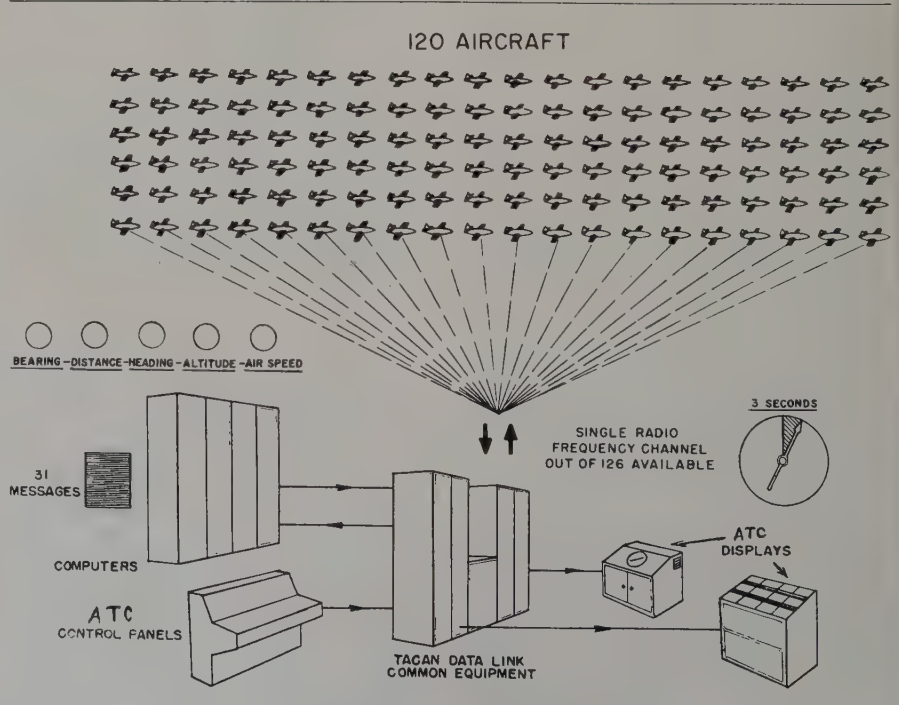


Fig. 1 TACAN DATA LINK SERVICES

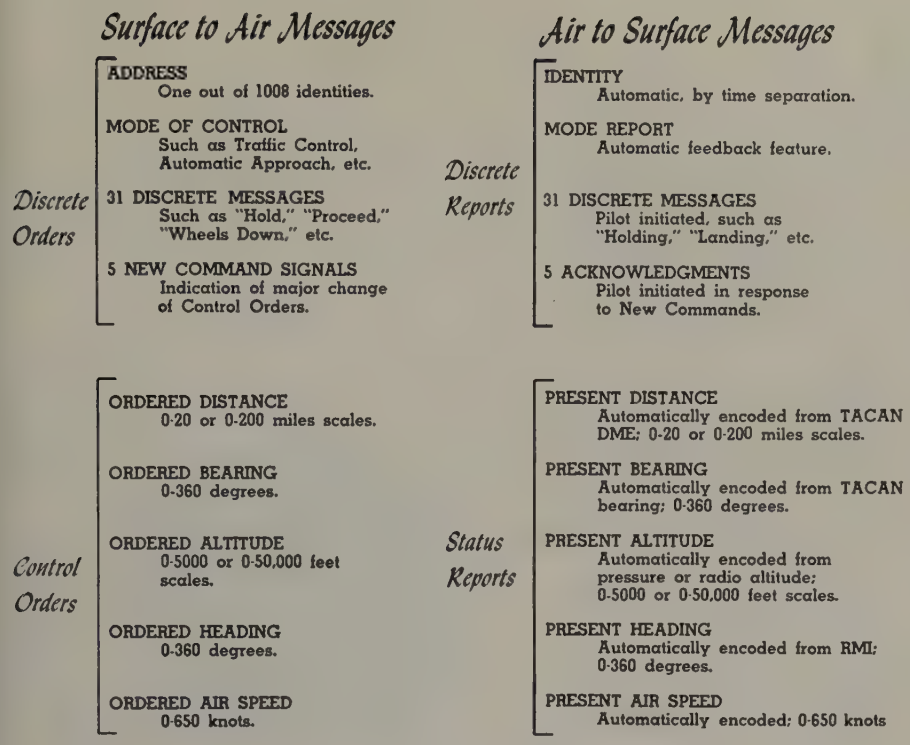


FIGURE 2. TACAN DATA LINK MESSAGE CONTENT

The accuracy with which data is transmitted is commensurate with the accuracy of the basic data itself. The discrete orders and discrete reports are transmitted with protective coding features so that *errors are practically impossible.* The control orders and status reports have tapered accuracy depending on the significance of the data. Thus, bearing signals are precise to within ½° and heading messages to within 2°. Comparable accuracies are employed for the other orders and reports.

The TACAN Data Link equipment co-located with each VORTAC site is capable of handling 90 messages per sec. (45 surface-air "orders" and 45 air-surface "automatic reports"). Since each VORTAC site is capable of simultaneously servicing 120 aircraft, within each 2-2/3 sec., every aircraft can receive an individually addressed order and transmit back its automatic report. It has been estimated that voice transmission of this data for the 120 aircraft would require one hour, as compared to the less than 3 sec. provided via the Data Link. Considerable attention had been paid to the problems of integrating TACAN Data Link with an air traffic control system.

Any aircraft equipment with TACAN distance and bearing equipment or VORTAC DME equipment can be provided with TACAN Data Link service by the addition of the Data Unit. This unit, consisting entirely of pulse and video circuitry, provides Data Link service simultaneously with TACAN or VORTAC distance and bearing service on the same r-f channels without any additional transmitters or receivers. *Fig. 3* shows a VORTAC DME aircraft installation plus a smaller Data Unit which might be used to add DATA LINK for air traffic control purposes to a VORTAC installation. In both cases, it should be noted that navigational information is unimpaired and no additional instrumentation is added to the overcrowded instrument panel.

One of the features of TACAN Data Link is the two-way transmission of standardized procedural messages. Anyone familiar with the air-traffic-control situation realizes that a large percentage of the present air-to-ground voice communications consists of the relaying of a few routine messages. The selector shown contains the more common of these routine messages. These are separated into categories from which individual messages are then selected by the pilot for transmission to the ground by pressing the corresponding button.

The TACAN Data Link is a communication system; as such, it can handle any information which is supplied to it, consistent with its capabilities. The primary emphasis is to provide displays of all information, both commands and reports, without the necessity of adding instruments to the already overcrowded control panel. Accordingly, the DME, bearing, RMI, airspeed and altitude instruments were modified, first, to provide ordered distance, heading, bearing, airspeed, and altitude; and second, to provide means for encoding the aircraft's distance, bearing, heading, airspeed, and altitude for transmission back to the surface. These replacement instruments, hermetically sealed, are but slightly larger than standard instruments due to miniaturization techniques. The only additional instrument required in the group is the message and mode-of-operation display instrument which displays any one of the 31 canned messages being sent from the surface and any one of 6 modes of operation (types of ground control). Each instrument also contains a 3-position teller indicator in the lower right-hand corner: red indicates off, or malfunction; green indicates proper operation; and yellow calls the pilot's attention to a New Command. Each teller may also be pushed to send an acknowledgment of this New Command back to the surface.

TACAN Data Links which are used primarily for air traffic control could be less complex than the full 2-way military system. The amount of surface-to-air control information which has to be transmitted is greatly reduced. In fact, the major use of Data Link in the air traffic control picture may be for automatic air-to-ground reporting of the aircraft's status. It relieves the pilot of having to read his instruments and relay the readings over voice radio; it relieves the ground operator of properly translating these voice reports into symbolic form for displays

(Continued on page 51)

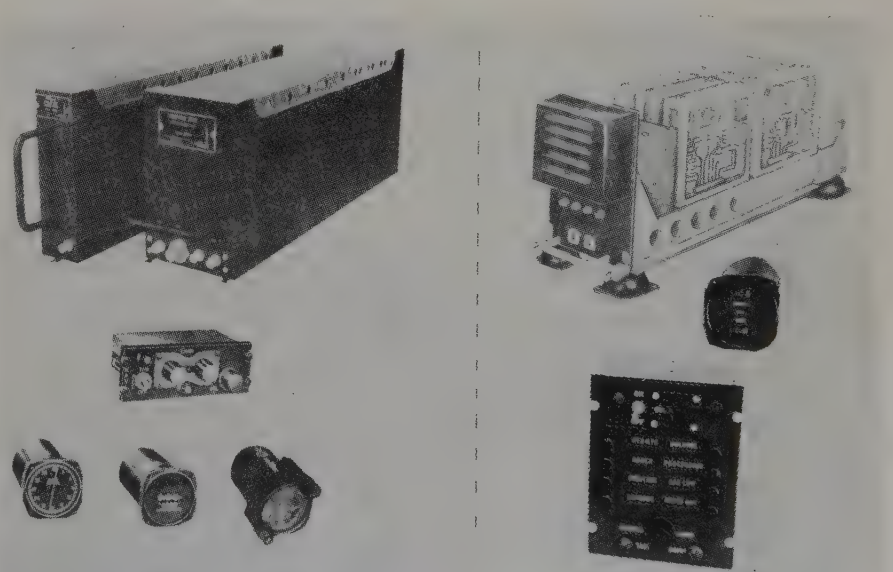


FIGURE 3. SIMPLIFIED AIRBORNE TACAN DATA LINK INSTALLED WITH VORTAC SET

NAVICOM

Airborne Radar Beacon Program Rolling; Civil Units Ready in '57

With the constantly increasing emphasis on both ground and airborne radar, attention has been focussed mainly on storm avoidance and anti-collision properties. Meanwhile, government and the radio industry have been going ahead with a development that will make a significant dent in air traffic congestion.

What may become a vital link in the traffic control system of the future is the interrogator-transponder system, also called 'radar safety beacon' or 'secondary radar.' In this system, the signal from a ground interrogator antenna, rotated in synchronism with the surveillance radar antenna, triggers a return signal from a transponder in an aircraft. This signal reinforces the radar echo on the scope, providing an indication of aircraft despite rain clouds or ground clutter, or operation near the maximum range of the radar.

The pilot may also send a special identification pulse at the controller's request, eliminating the necessity of performing identifying maneuvers. The pulse would show as a burst of light, color or other identification near the aircraft's blip on the radar scope. The transponder could be used further to transmit identification or flight data to the ground automatically by means of pulse codes.

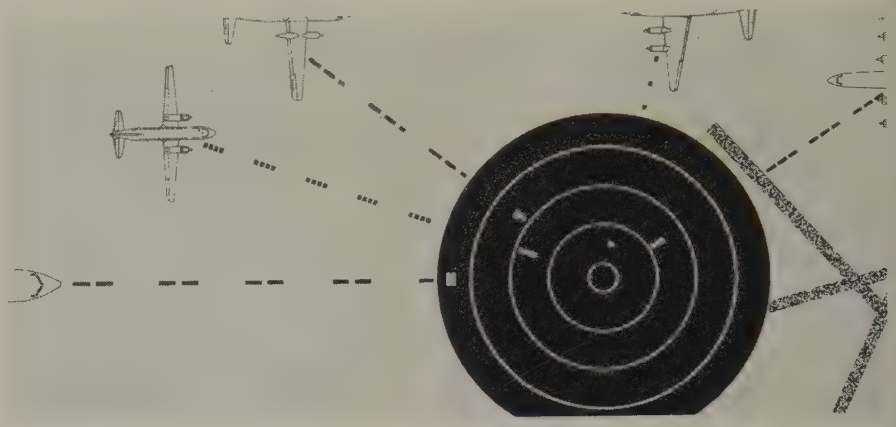
Both RCA and Collins are offering off-the-shelf Air Traffic Control Transponders for early delivery this year. Designed as new civil units meeting the requirements of ARINC Specs Characteristic #532-A, some of the first will go into large airline fleets such as EAL this summer. Average weight will be about 25 lb., size ½ ATR rack, power requirements in the order of 195 VA at 115V 300-1000 CPS, .06 A at 28 VDC. Power output will be 1000-watts, ample to work any Center Interrogator within significant ATC ranges today in domestic service. Receiving on 1030mc, transmitter frequency will be 1090 mc, with 64 code combinations possible, ample for most hi-density areas.

The interrogator-transponder system is scheduled to undergo service environment tests later this year under the auspices of the Air Navigation Development Board (ANDB) and the CAA. Interrogating equipment will be installed at the Idlewild, LaGuardia and Newark towers, the New York Air Route Traffic Control Center, the Chicago center, the O'Hare tower, the Washington tower and center, and the Norfolk center.

Collins has begun production on its 621A-1 Transponder for this purpose, which illustrates in detail how the interrogator-transponder system works.

This airborne transponder receives two accurately spaced pulses from the ground interrogator. A decoder in the 621A-1 identifies the pulses as an interrogation by their 8-microsecond leading-edge-to-leading-edge spacing, and a reply is initiated on 1090 mc.

The reply consists of 2 framing pulses, a group of up to 6 information pulses each spaced at 2.9 microseconds, plus a special identification pulse



spaced 24.65 microseconds from the beginning of the first pulse. This provides up to 64 different codes in addition to the special identification pulse, and these could be used to indicate the flight or altitude, or conceivably such information as destination, landing intentions or responsible controller.

On the ground, the return appears on the radar scope. The coded information will probably be translated into some type of display, either on the scope or independently.

RCA is also in the field with their AVQ-60 ATC Transponder. This equipment, which also meets the requirements of ARINC'S Characteristic #532-A, weighs 25 lbs, is also ½ ATR size and has power output of 1000 watts. It too, is capable of 64 code combinations.

Coding is accomplished by a beam switching tube instead of a conventional tapped delay line. This resulted in the elimination of many components, greatly increasing reliability. Sectionalized plug-in chassis construction is used throughout for easy maintenance. Space and provisions have been made for further expansion.

The tuned cavity R-F section provides extremely reliable operation due to its inherent simplicity, while maintaining more than adequate stability. Silicon diode rectifiers are used exclusively in the power supply instead of conventional vacuum tubes. Provision is made for both self-contained and downdraft cooling.

At the 8th Annual Maintenance and Operations Meeting in Reading, Pa., in June, RCA also expects to show a lightweight weather avoidance radar system. This unit will be suitable for installation in many of the *lighter twin engine* airplanes.

The Center program for installation of Interrogators was put off in some areas from a target date of Jan. 1 to Jul. 1. Although the spread of equipment installation airborne may not be as fast as some other developments, it is a sure bet that the obvious advantages in faster and more efficient traffic control will encourage a large percentage of scheduled operators and large business aircraft fleets to invest.

Safety will, of course, be a bonus unrelated to ATC delays, particularly when precipitation blots the current long-range radar displays. Any advance that expedites any portion of the traffic load will make itself felt in general overall increased efficiency benefiting everybody.

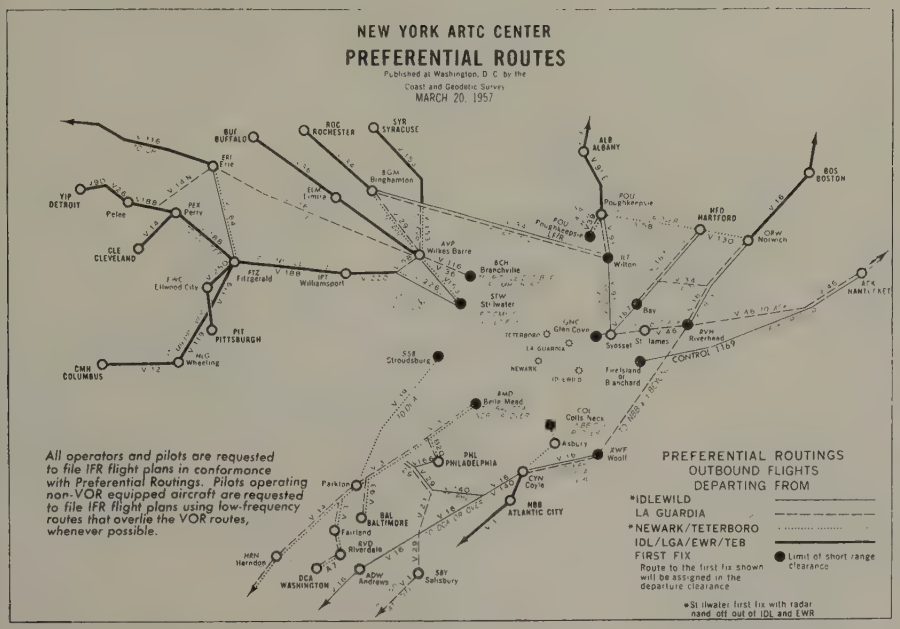
Bell Automatic Landing System

The Bell Automatic Carrier Landing System has successfully completed all land trials and will soon be installed on a carrier for tests. Developed under U.S. Navy contract, it has completed more than 1200 landings with a high rate of precision.

Completely automatic, ACLS has successfully landed 6 different types of jet fighters, large transport airplanes and light commercial aircraft at a number of different bases. It operates in all kinds of weather.

The system, which is highly mobile, is a combination of radio and radar. Radar locates the airplane and determines its altitude and position in relation to runway or deck. An electronic computer does the rest, sending the necessary course corrections to a device which directs the airplane into the desired flight path. The system takes into account the carrier's movement the instant the plane is to touch the deck. If the airplane is not in the best attitude for a safe landing ACLS automatically sends the airplane around for another attempt.

During one part of the land-based phase of the test program, Cdr. Russell, ass't. head for All-Weather Matters, Office of the Chief of Naval Operations, was successfully guided through 4 actual blind landings during a heavy snowstorm at Niagara Falls Airport adjacent to Bell Aircraft's main plant. Other airplanes in the area were unable to take off or land because of the restricted visibility which was less than ¼ mi.



Air Force Installs Sequence Flashing Centerline System

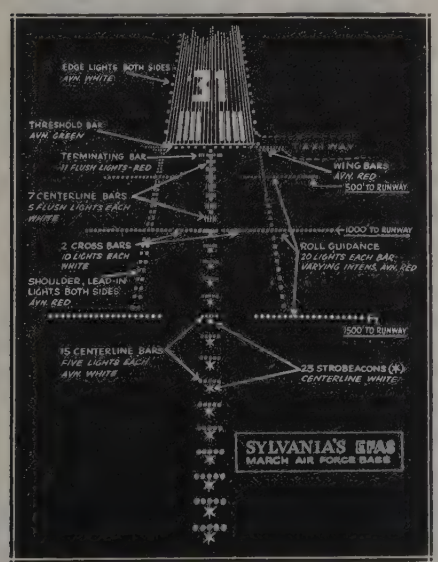
Because many pilots have not yet had the opportunity to observe nor to make approaches on the new sequential flashing centerline approach lights already installed at Newark, Idlewild and Boston Logan Airports, SKYWAYS publishes herewith the illustrated announcement of their pending installation at all Air Force bases.

Installed at March AFB, Riverside, Cal., the accompanying illustrations show the layout itself of the Sylvania EFAS (Electric Flash Approach System) and one of the best illustrations we have seen of how the system looks shortly after breakout below a low ceiling.

A U.S. Air Force B-52 Stratofortress, landing gear and flaps down, descends swiftly in its glide path over the new Electronic Flash Approach lighting system at March AFB, Riverside, Cal., a major base of the Strategic Air Command.

Ultra-brilliant flashes fired in sequence by Sylvania Strobeacons in the system's center-line row of lights form an animated arrow of light that points out the safe landing area to the pilot of the incoming swept-wing bomber.

The 23 Strobeacons, which form the nucleus of the system, emit fog penetrating light bursts of 30 million candlepower in sequence twice per second—creating an effect like that of huge tracer shells traveling at 3,600 mph toward the March AFB runway. One of the light bursts, which last just 1/5,000 second (too short duration to effect pilot's dark adaptation) is visible to the left and forward of the B-52's nose.


EDGE LIGHTS BOTH SIDES AVN. WHITE
THRESHOLD BAR AVN. GREEN
TERMINATING BAR 11 FLUSH LIGHTS-RED
WING BARS AVN. RED 500' TO RUNWAY
7 CENTERLINE BARS 5 FLUSH LIGHTS EACH WHITE
1000' TO RUNWAY
2 CROSS BARS 10 LIGHTS EACH WHITE
ROLL GUIDANCE 20 LIGHTS EACH BAR VARYING INTENS. AVN. RED
SHOULDER, LEAD-IN LIGHTS BOTH SIDES AVN. RED
1500' TO RUNWAY
15 CENTERLINE BARS FIVE LIGHTS EACH AVN. WHITE
23 STROBEACONS CENTERLINE WHITE
SYLVANIA'S EFAS
MARCH AIR FORCE BASE

"Amplitron" Tube Beefs Up Radars

Developed by Raytheon Mfg. Co. under sponsorship of the Army Signal Corps Engrg. Labs., Ft. Monmouth, N. J., a new radar tube's peak power is equal to that needed to light a city of 200,000 people. Called an "amplitron", the new tube effectively "beefs up" the radar's performance by amplifying or boosting the energy output of the basic signal as much as 8 to 14 times.

When added to the air traffic control radars now being built by Raytheon for the CAA, the effective range of

DALLAS AIRMOTIVE

points with pride . . . to its new facility

Dallas Airmotive, a pioneer in the field of aviation services, is proud to announce the formation of its Island Service Division.

At Galveston, in one of the most completely equipped installations of its kind, Corporate, Private and other Aircraft Operators will find:

- Modification of all types of aircraft
- Custom luxury interiors
- All types of airplane painting
- Radio-Electronics-Navigation sales and installation
- Transient service
- Overhaul for conventional and helicopter aircraft
- Storage
- Accessory sales, installation and overhaul

In Dallas, Dallas Airmotive will continue to provide the finest engine overhaul services.

Island Service Division
GALVESTON, TEXAS

Now — all aviation services from the same Reliable company.

DALLAS AIRMOTIVE

6114 FOREST PARK ROAD
FLEETWOOD 1-3771 • DALLAS, TEXAS

Washington Office:
Woodward Building
733 15th Street, N.W.
Washington, D. C.

New York Office:
1219 Marine Terminal Bldg.
La Guardia Station
Flushing 71, N. Y.

these sets will be increased from 200 mi. to about 350. Amplitron-equipped radars will also be able to scan an assigned area electronically without sweeping their antennas or resorting to mechanical or electrical adjustment.

The amplitron's small size and low power requirement reduces cost and the problem of power supply. It is only ¼ the size of previously available devices that could amplify power to comparable levels, and operates on less than ½ the voltage required for competitive amplifier tubes at microwave frequencies.

The amplitron is twice as efficient as any present tube of comparable bandwidth, and has 10 times the bandwidth of any tube of comparable power.

Approach Light Contact Replaces Threshold Contact at Newark

The Newark Ceiling-Visibility Evaluation Program being conducted at Newark Airport by the U.S. Weather Bureau and sponsored by ANDB and the AF Cambridge Research Center *will give out approach light contract height estimates* rather than threshold contact height estimates beginning May 1.

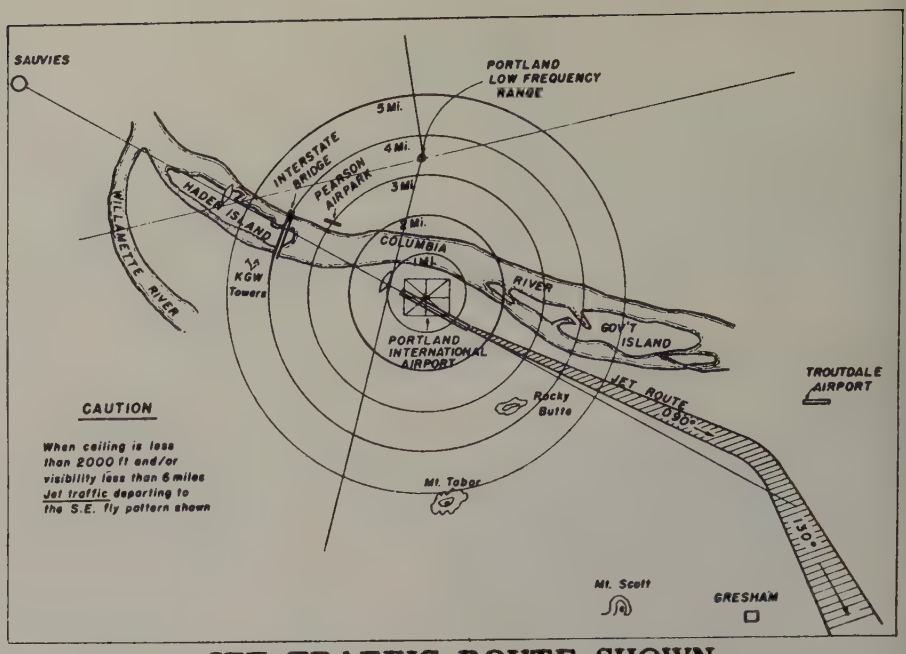
A major portion of the pilots contacted who have experienced reduced-visibility approaches at Newark have indicated that the program would be more valuable if the evaluation were based on slant visual range to the approach lights instead of the threshold lights.

Approach light contact estimates will be given out only by CAA local controller on 118.3mc at the time each pilot reaches the outer marker inbound for a straight-in ILS approach to Runway 4. The message will take the form, ". . . cleared to land, expect approach light contact between 300 and 400'—report approach lights in sight." These vertical height estimates refer to the altitude on the glide path. Evaluation of the accuracy of these estimates is based solely on the report given by the pilot; it is therefore important that the report "Approach Lights" be given the instant the approach lights are sighted.

The change to approach light contact will permit meteorologists to determine the accuracy of a method to use ground based instruments to "forecast" the slant visual range of an approaching pilot. Pilots are urged to visit the project bldg. adjacent to the Newark control tower, or phone the project personnel at MI 2-4414.

Portland, Ore., Airport Jet Traffic Route

The route used by jet aircraft when departing to the SE from the Portland International Airport when the ceiling is less than 2000' or visibility is less than 6 mi. is shown in the accompanying diagram. Immediately upon leaving the airport jet aircraft climb out on a heading of 090° for 2 min., then turn to 130° and continue climbing to 16,500', or until clear of overcast, before turning. Jet aircraft departing to the NW under these conditions continue straight out till beyond Sauvies. When ceiling and visibility are above the 2,000' and/or 6 mi. limit. conventional patterns, i.e., right or left turn out as cleared by tower, are followed.



JET TRAFFIC ROUTE SHOWN

Claude Thompson, Chief of Portland Tower, suggests that during good weather traffic passing through the Portland area stay above 2000' as a safety measure. Common sense requires all pilots to be vigilant when flying in the Portland area. This is particularly true when flying between Sauvies Island and the Portland Airport if there is a cloud cover lower than 3,000' (or in any event keep well clear of the clouds) because all instrument or airport area approaches are tied in with the Sauvies radio.

Restrictions Lifted on Admittance Of NL Aircraft to Canada

As a result of efforts by the NBAA to abolish the restrictions which have hitherto prevented the regular and frequent operation of U.S. business aircraft into Canada, the Canadian Dept. of Transport has issued a ruling which advises U. S. operators that "Limited and Restricted Category aircraft will be admitted into Canada for periods up to 30 days, provided they are used for private purposes or as executive transport aircraft only. In no case are passengers other than those included in the above classification to be carried. The carriage of goods or freight will not be permitted."

NBAA worked 9 months to effect this change of ruling. Through facts and figures provided by members, NBAA was able to place a clear-cut case before the Dept. of Transport, which resulted in this successful conclusion.

New Converter Facilitates Dual Omni Installation

NARCO VOA-3 gives four-in-one presentation for VOR/ILS Localizer navigation, mounts in any standard instrument cut-out. Course is selected by turning knob until needle is centered. Selected course is indicated at bottom of azimuth; reciprocal course is automatically shown at top. To-From indication is shown in window behind Left-Right needle with red sector showing if signal is too weak for accurate navigation. VOA-3 is an Omni converter for use in conjunction with the Narco Sapphire 1016 560-channel VHF transmitter-receiver or the Narco VC-27 Simplexer communications unit, and adds only 4 lbs.

Pilots Employment Announces New Ground Services Division

Pilot's Employment Agency has announced the establishment of a Ground Services Div., under the direction of George S. McVicar, to screen and test personnel for positions as mechanics, dispatchers, stewardesses and in administration.

Pilots Employment Agency, largest agency in the field of air transportation personnel, continues its service in the employment of pilots and flight personnel. *(Continued on page 52)*

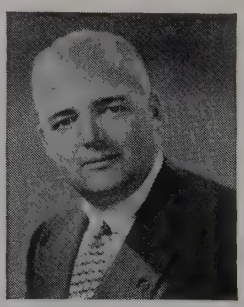
The vital role of business flying in American economic progress — and vital role of test-proven equipment in business aircraft fleets — is discussed with Fisher by Cessna Executives James Herrick, Fleet Sales, and T. Guy Miller, Sales Manager (L/R). They describe "excellent results" obtained with Champion Spark Plugs during rigorous flight-testing of this new 4-engine Cessna 620 pressurized executive transport . . . and confirm thousands of hours of safe flying with Champions in other Cessna models.

The nation's business aircraft fleets . . .

like the major airlines . . .

keep in flight fitness with CHAMPIONS.

Noted aviation authority reports on . . .



by
HERB FISHER
international aviation authority, veteran test pilot and author

Operation Business Flying

Test Pilot Fisher (L), who flew this plane some 2,465 miles (Wichita-New York-West Palm Beach) with one fuel stop, hears of Champion's long-life dependability and easy accessibility to this Continental engine from Cessna executives, Bill Eikenberry and Bill Fergusson (L/R).

Operation Business Flying

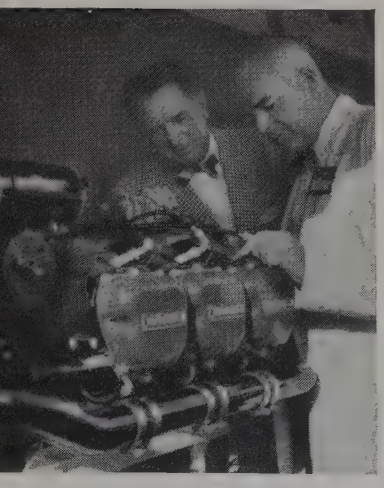
FAMILIARITY with volume testing and selecting of aircraft equipment by leading airlines sparked my curiosity about product performance and preference among individual units of the nation's vast business aircraft fleet.

For here we have a three-fold operational contrast between civil aviation's two largest bodies: Unlike the airlines, the great armada of private craft in the business aircraft fleet comprises nearly every make and model; individual business fleet crews themselves often rate performance and determine selection of their own aircraft equipment; and individual companies put their company-style planes to a variety of use quite beyond that of the airlines.

In looking into the matter with the National Business Aircraft Association, I was struck by the enormity of this non-airline fleet and by its importance in service to the national economy. That the airplane is now playing a commonplace and increasingly vital role in American business and industry was evidenced everywhere at the recent N.B.A.A. Annual Convention in Miami, Florida, attended by more than 600 pilots and executives from over the country. In my 28 years in aviation, I have never met any group more enthusiastic about the utility of the airplane as a safe, efficient working tool. Nor have I ever met pilots more keenly aware of their serious responsibilities regarding objective appraisal of the equipment they use.

I talked with scores of business pilots and executives and checked a lot of records to get the perspective of business flying's growth to maturity in aircraft equipment experience.

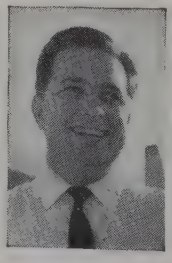
In singling out a representative functional plane part to trace in its development and modern-day application, I was struck by the overwhelming preference for Champion Spark Plugs in the multipurpose, multitype business aircraft fleet. The sizable cross section of pilots I objectively polled said they settled on Champions after extensive periods of trial-and-error with various types of spark plugs. They described familiar engine problems al-



Mike Murphy (L), Flight Operation Director, Ohio Oil Company, Findlay, Ohio, tells Fisher: "We've used Champions for many years without problems. I've been in this flying business a long, long time, and I know Champions are tops."

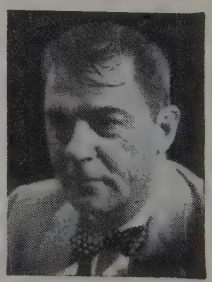
Chief Pilot Robert J. Kusse, Fruehauf Trailer Company, Detroit, recipient of N.B.A.A. Million Miler Safety Award, reports: "Our fleet (Lodestars, D-18's, Ventura, Norseman, Mallard and Bell Helicopter) is tailored for specific needs. Champions, we find, are tailor-made for all our specialized aircraft – and we use Champions in all. Never had any plug problems with Champions."

"Champions afford maximum utilization of our equipment. Champions' trouble-free operation unquestionably contributes to our high degree of on-time departures, an essential requisite in operation of a business fleet." Gerard J. Eger, Secretary, International Harvester Company, Chicago, and a board director of the N.B.A.A.



Dale Westfall, Chief Test Pilot for Cessna Aircraft Company, Wichita, Kansas, points up company policy regarding the new 4-engine Cessna 620: "Our top test-flight performance with the new 620 has included use of Champions from the beginning. My chief mechanic and I have found Champions performance-perfect."

"We received a Safety Award for flying 4,272,894 miles without mishap. Contributing to that record was the use of Champion Spark Plugs. We've had no plug trouble for six years – since using Champions." Ralph E. Piper, Chief Pilot, Monsanto Chemical Corporation, St. Louis, and a board director of the N.B.A.A.



A special report for Champion Spark Plug Company

"We have used Champions for 10 years in our Cessna, Beech and Lockheed fleet. They have always given us extremely good service." Chief Pilot Richard W. Smith, Champion Paper and Fibre Company, Hamilton, Ohio.

"Our fleet of airplanes flew 1,785,000 miles last year. The entire fleet has used Champion almost exclusively. Our millions of miles with Champions the past twelve years have shown us that they are safe and reliable." N.B.A.A. President Henry W. Boggess (L), Director of Aviation, Sinclair Refining Company, Tulsa, Oklahoma and Joe Lacey (C) Sinclair's Chief Pilot.

leviated only by proper application of Champions.

This singular experience with nearly all types of aircraft equipment – to procure the best parts possible for maximum efficiency in a wide variety of flying operations by a wide variety of plane types – is synonymous with business flying's spectacular development.

Few companies realized the advantages of operating their own business aircraft prior to World War II. Aviation equipment studies were unheard of in private business and industry. Of a total of 4,460,000 hours flown by all non-airline utility aircraft in 1941, only 250,000 hours were for business purposes while some 883,000 hours were recorded for pleasure flying.

At the war's end, however, with booming business competition and a shortage of airline transportation, ingenious business executives supplemented airline travel with company-owned and operated planes; many were former military transports. And such questions as, "What's the best equipment for us – the best spark plugs, for example?" became commonplace.

Private companies were then in the business of aircraft maintenance. Their plane crews found themselves in almost daily involvement in the procurement of aircraft equipment suitable to the company's specialized needs regarding plane types and operational purposes. Duties of the tailor-made fleet ranged from executive travel in multi-engine jobs to cross-country industrial map-making.

In 1955 the nation's vast business fleet had reached maturity in the application of aircraft parts and equipment to its varied operation. Our little barometer of trial-and-error product success – the Champion Spark Plug – had come into its own as an almost exclusive spark plug in many types of aircraft engines. Business flying chalked up an impressive 4,300,000 hours that year alone. And the hours continue to climb, holding promise of 5,700,000 hours by 1960 . . . 7,800,000 hours by 1965 . . . and 9,900,000 hours by 1970.

Thus, the small, almost insignificant business aircraft fleet of the early 1940's has become the mature giant of the late 1950's, overshadowing every other development in the field of transportation—a growth rate paralleling the progress of far-sighted industry and business. The business executive, salesman and engineer found new mobility—6,000 airports for his access by company plane as compared to but 600 terminal airports available by domestic carriers.

Today some 6,000 companies are using approximately 21,500 privately owned aircraft to transport their personnel and customers, and in many cases cargo, in the daily conduct of business. Some 2,400 are multi-engine aircraft, most of them equipped with the very latest in navigation and electronic equipment, as well as with Champion Spark

"Champion Spark Plugs are synonymous with dependability," Charles Morris (R), Chief Pilot, Socony Mobil, New York, tells Fisher (L). "Our 28-plane fleet operates all over the world. Champions guarantee top engine performance under any conditions." W. R. Dotter (Center), Chief Pilot, International Harvester, Chicago, reports: "Our fleet flies 800 hours a year per plane. We've used Champions from the beginning of our business flying 10 years ago and never have had any trouble with them."

"Nowhere in the history of a single test program has the DC-3 been put through three complete engine configurations as has this Challenger 250. We started with 92's, ran a complete 4B program plus 94's and R2000's. We pulled take-off horsepower with Champions for as much as seven continuous hours with no plug failures. This airplane has since flown through all kinds of weather and climate in North and Central America – and our Champion installations have proved without equal." So spoke Captain Jim Hurst, Executive Vice President of Aircraft Conversion Corporation, Detroit, a 12,000-hour pilot and former employee of Pan-American World Airways for 14 years. Pictured (L/R): H. C. Walls, Supt. of Field Operations, Miami International Airport; Captain Joe Clemow, Chief Pilot for Eastman Kodak, Rochester, New York; and Captain Hurst.

"We use Champions almost exclusively in our DC-3 and DeHavilland business fleet. We'll swear by them." Frank J. Dolinski, Chief Pilot, Aerojet-General, Azusa, California.

Plugs. There are also 19,000 single-engine planes and helicopters in business operation. The entire business fleet's record of safety and dependability is testimony to the proficiency of the pilots and efficiency of the aircraft and equipment they use.

Closely tied to the success of business flying is the N.B.A.A., organized in 1947 by 13 members operating 19 business airplanes. The N.B.A.A. represents the aviation interests of its members, presenting a united front in matters requiring organized action to improve aircraft, equipment and service, and furthering the cause of safety and economy in business plane operations. Present membership includes some 400 leading business organizations operating more than 1,000 aircraft, over 600 of which are multi-engine.

Champion staunchly endorses the N.B.A.A.

Proof of the N.B.A.A. member companies' adherence to the principles of safe operation of dependable aircraft and equipment lies in its annual Safety Award presentations. Twenty-nine pilots who had flown more than 1,000,000 miles each without accident or injury were honored at the Miami convention, as were 26 companies that had recorded a total of 47,036,788 consecutive accident- and injury-free miles flown with business aircraft. N.B.A.A. Safety Awards represented 121,908,052 hours of flying completely accident-free. Pilots emphatically told me that the attainment of such safety records would not be possible without the cooperation of the ground service operators throughout the country . . . and without the top-flight parts and equipment of American industry, such as Champions.

For their excellent cooperation in helping me obtain information at the Miami Convention, I wish to thank Bill Lawton, *N.B.A.A. executive director,* and his cheerfully efficient secretary, Corda Mae Cearnal, better known as "C.M."

— HERBERT O. FISHER

CHAMPION CONGRATULATES RECIPIENTS OF 1956 N.B.A.A. SAFETY AWARDS

Some of the pilots receiving N.B.A.A. Safety Awards for flying more than a million miles without accident or injury. Center is Miss Pat Walker, "Miss Business Aviation of 1956," and at her right, J. V. Swanson, Chairman of N.B.A.A. Awards Committee and Chief Pilot for Sears Roebuck.

N.B.A.A. Member-Pilot "Million-Miler" Safety Awards

1,000,000 OR MORE ACCIDENT- AND INJURY-FREE MILES FLOWN IN BUSINESS AIRCRAFT

NAME OF "MILLION MILER"	ORGANIZATION	CONSECUTIVE PLANE MILES FLOWN
ROBERT F. ALLEN	Frankfort Oil Company, Tulsa, Okla.	1,488,379
RAOUL CASTRO	International Harvester Company, Chicago, Ill.	1,153,039
L. P. CORNWALL	Chrysler Corporation, Detroit, Mich.	1,075,000
W. R. DOTTER	International Harvester Company, Chicago, Ill.	1,141,216
AL EAGER	Crane Company, Chicago, Ill.	1,071,000
E. W. ESTELLE	Esso Shipping Company, New York, N.Y.	1,516,250
HARVEY H. GLASS	Texas-Illinois Natural Gas Pipeline Co., Chicago, Ill.	1,296,000
ROBERT L. HANSEN	Kroehler Mfg. Company, Naperville, Ill.	1,017,650
W. P. HOBSON	Hercules Powder Company, Wilmington, Del.	1,161,299
JACK C. JONES	Fairbanks, Morse & Co., Chicago, Ill.	1,800,000
JAMES E. KIDD	Anchor Hocking Glass Corp., Lancaster, Ohio	1,034,600
LOREN D. KIRBY	Universal Moulded Products Corp., Phila., Penn.	1,046,544
A. C. KORB	Westinghouse Electric Corp., Pittsburgh, Penn.	1,000,000
ROBERT J. KUSSE	Fruehauf Trailer Company, Detroit, Mich.	1,013,308
J. SHELDON LEWIS	Thatcher Glass Mfg. Co., Inc., Elmira, N.Y.	1,108,000
C. J. LUND	International Paper Co., Mobile, Ala.	1,131,700
S. M. MAXWELL	Burlington Industries, Inc., Greensboro, N.C.	1,107,915
B. OWEN MAYFIELD	Hercules Powder Company, Wilmington, Del.	1,370,619
GEORGE E. MEYERS	Monsanto Chemical Company, St. Louis, Mo.	1,150,000
N. L. MITCHELL	Minneapolis Star & Tribune, Minneapolis, Minn	1,156,750
RALPH E. PIPER	Monsanto Chemical Company, St. Louis, Mo.	1,152,000
G. P. RIDER	Delta Drilling Company, Tyler, Texas	1,044,000
NELSON U. ROKES	Procter and Gamble Co., Cincinnati, Ohio	2,800,608
THOMAS J. SCHUETZ	International Harvester Company, Chicago, Ill.	1,140,969
G. W. SHERWOOD	Briggs Manufacturing Company, Detroit, Mich.	1,182,060
ORVILLE E. SPARKS	Holley Carburetor Company, Detroit, Mich.	1,019,024
D. M. TEEL	U. S. Steel Corporation, New York, N.Y.	1,017,000
R. N. THURSTON	Monsanto Chemical Company, St. Louis, Mo.	1,226,048
C. H. VON HOLLEN	Union Bag-Camp Paper Corp., Franklin, Va.	1,200,000

N.B.A.A. Member Meritorious Safety Awards

1,000,000 OR MORE ACCIDENT- AND INJURY-FREE MILES FLOWN IN BUSINESS AIRCRAFT

NAME OF ORGANIZATION	CONSECUTIVE PLANE MILES FLOWN
ANCHOR HOCKING GLASS CORPORATION, Lancaster, Ohio	1,430,000
ARMCO STEEL CORPORATION, Middletown, Ohio	1,174,248
BURLINGTON INDUSTRIES, INC., Greensboro, North Carolina	3,596,701
CHAMPION SPARK PLUG COMPANY, Toledo, Ohio	1,037,540
CLUETT, PEABODY & CO., INC., New York, N.Y.	1,597,500
COLUMBIA-GENEVA STEEL, San Francisco, Cal.	2,632,885
DELTA DRILLING COMPANY, Tyler, Texas	1,044,000
ESSEX WIRE CORPORATION, Fort Wayne, Ind.	1,267,000
ESSO SHIPPING COMPANY, New York, N.Y.	3,556,895
S. J. GROVES & SONS CO., Minneapolis, Minn.	1,110,000
HERCULES POWDER COMPANY, Wilmington, Del.	2,292,112
HOLLEY CARBURETOR COMPANY, Van Dyke, Mich.	1,286,852
INTERNATIONAL HARVESTER COMPANY, Chicago, Ill.	1,937,250
INTERNATIONAL PAPER COMPANY, Mobile, Ala.	1,897,557
KROEHLER MANUFACTURING CO., Naperville, Ill.	1,752,200
MINNEAPOLIS-HONEYWELL REGULATOR CO., Minneapolis, Minn.	1,635,000
MINNESOTA MINING AND MANUFACTURING CO., St. Paul, Minn.	1,421,969
MONSANTO CHEMICAL COMPANY, St. Louis, Mo.	4,272,894
OWENS-ILLINOIS GLASS COMPANY, Toledo, Ohio	1,816,265
THE PROCTER & GAMBLE COMPANY, Cincinnati, Ohio	1,584,754
SOUTHERN NATURAL GAS COMPANY, Birmingham, Ala.	2,493,862
TEXAS GAS TRANSMISSION CORPORATION, Owensboro, Ky.	1,100,000
TEXAS-ILLINOIS NATURAL GAS PIPELINE CO., Chicago, Ill.	1,397,520
THOMPSON PRODUCTS, INC., Cleveland, Ohio	1,370,000
UNITED STATES STEEL CORPORATION, New York, N.Y.	1,285,240
UNIVERSAL MOULDED PRODUCTS CORPORATION, Philadelphia, Penn.	1,046,544

CHAMPION SPARK PLUG COMPANY

TOLEDO 1, OHIO

Let's Get Rid of Cost-Per-Mile

By Robert K. Polson

Cost-per-mile (more correctly entitled expense-per-mile) has been used in Business Aviation for various purposes. There is strong evidence that this method of cost analysis does not do what it is supposed to do. In addition, the practice is harmful to the industry in general.

Cost-per-mile is computed operationally (by many companies) on current expense, which is not the "true cost of ownership." You won't know the actual expense until you see how much the aircraft is worth when it is sold or traded. This problem is further compounded by the difference between normal corporate tax rates and the tax rate for capital gain. You cannot view cost-per-mile as your actual expense for this reason. The error is considerable.

Although this criticism applies to other forms of cost analysis, the fact remains that cost-per-mile (based on current expense) is somewhat mythical —to the detriment of the Aviation Dept.

Now, assuming your cost-per-mile figure accounted for these tax differences, what do you propose to do with it? Expense data is usually compared with *something*. Suppose we look at the comparison which shows the efficiency of the Aviation Dept.—the business judgment of the pilot.

Expense figures for a typical twin-engine aricraft which cost $130,000 new are included below as they might appear on the company books. The exact figures are not too important. We're concerned with a principle, not with precise expenses. These simplified per annum figures (based on 570 hrs.) may be divided into three classifications as follows:

Controllable by Policy	
Depreciation (5 years to $0.00)	$26,000
Flight crew salaries	16,800
Insurance	4,000
Pilot training	1,800
Sub-total	$48,600
Non-Controllable	
Fuel & Oil	$11,000
Engine exchange	8,000
Hangar rent	2,400
Landing & transient hangar fees	1,000
Sub-total	$22,400
Controllable by the Pilot	
Routine maintenance	$5,000
Flight crew expenses	2,000
Food, tips, misc.	2,000
Sub-total	$9,000
(Total Yearly Expense	$80,000)

Engine exchange expense was classed as non-controllable because the companies who are equipped to do the job right do not vary a great deal in price. Moreover, if you investigated the problem thoroughly, you probably came up with a finalized decision—expense money which cannot be reduced further.

Suppose you (as the pilot) decided to cut the items which you control by 20%. Will this relatively large saving change the cost-per-mile index? Overall expense is now reduced by $1,800 yearly. If you flew roughly 100,000 mi. (Block speed—175 mph), this would cut the cost-per-mile from 80¢ to 78.2¢. Similarly, if you upped all the maintenance, food, and crew expense by 20%, the figure would rise to 81.8¢ per mi. The main point (never mind the exact figures) is that the dice are 95% loaded. The pilot, in most cases, is gambling with very small odds.

This principle should not discourage you from practicing reasonable economy measures. There's a vast difference between real money and a percentage of total expense. You should not, however, expect your efforts to show up in the cost-per-mile index.

Now pilot A may say, "But my figures for this same airplane aren't even close to 80¢." That's entirely possible. The finger is now pointed directly at policy expenses; that's where the big money is. Policy controls expense differences for a given type aircraft—a different policy, a different expense. (This is the basic weakness of statistical comparison of operating expenses.) The results show only a difference in management policy, not that one pilot is a lot smarter than another.

Pilot B may say, "OK, I'll buy the 80¢ figure as a reasonable average for this airplane, but my monthly costs show a much greater fluctuation than 3.6¢ per mi." That's very likely. Statistically, you look like Ebenezer Scrooge in June and the prodigal son in July. A monthly cost-per-mile figure is all over the place, and shows little more than the dates on which maintenance work was done.

The best practical measure of a pilot's business judgment (if it's desired) is a monthly report of pilot-controlled expense.

Having looked at the operational angle, let's consider the sales part of the picture. This is where cost-per-mile is hurting Business Aviation and everyone connected with it.

If we had the same policy behind the expenses for two different aircraft, we would have a slight case for using the figure to compare those two aircraft. Cost-per-mile does attempt to reconcile expense with speed. It does not account for differences in comfort. Office buildings are valued according to size; why not an airplane by cabin cubic feet? Or possibly:

$$\frac{\text{Expense per hour}}{\text{Cabin cubic feet} \times \text{Miles per hour}}$$

The criticism of using cost-per-mile for comparing different airplanes is based on a more important reason; if you keep the figures handy (for any reason), someone is going to attempt a comparison with public transportation fares. This is the natural tendency of any businessman who is interested in buying. This comparison looks very bad for the multi-engine fleet. Single engine airplanes compare more favorably, but why strangle the rest of the industry?

Every scrap of paper ever written on salesmanship states (without exception) that a salesman must stress the strong points of his product, *never* the weak ones. Deliberate effort could not turn up a weaker point than this. There is no buyer motivation in an unfavorable expense comparison. The exact opposite is true: you increase buyer resistance.

Are we being fair to the purchaser

(Continued on page 38)

OPERATORS *of airports and business aircraft will be interested in low-cost hangars constructed of poles impregnated with Dow Pentachlorophenol. Treated wood poles will last upward of 20 yrs. Top photo shows one of 2 pole-type hangers built for Grain Valley Airport Corp., comprising 30 Kansas City businessmen. Accommodating 15 planes, the hangers were built at a cost of $1.20 per sq. ft. Below is the pole-type hangar, 32' x 109' x 20', built for $1.75 per sq. ft. to house Southern Pine Lumber Co.'s 3 planes.*

SAFETY EXCHANGE

Further Details: ATC/TWA Dispute

Following is a verbatim transcript of the two-way radio transmissions between NY ARTC and TWA flight 19, Jan. 29th.

TWA: "N.Y. Center, this is TWA requesting 18,000."

NY: "TWA 19, traffic above you. Are you able to VFR to 18,000?"

TWA: "Negative."

NY: "Unable to approve 18,000."

TWA: "We're leaving 14,000 in about 3 min. You get him out of the way."

NY: "TWA 19, will you say that again?"

TWA: "I said we're going to vacate 14,000 to go up in about 3 min. Get him out of the way."

NY: "I am unable to approve a higher altitude on account of traffic at 16,000."

TWA: "Get 16,000 out of the way then. In the first place, we were off LaGuardia first ahead of that traffic, and that was our requested altitude and we should have had it. Is 18,000 available?"

NY: "Negative."

TWA: "Why not?"

NY: "I have traffic."

TWA: "I want to know what it is."

NY: "TWA 19, change over to company dispatcher and put your request through him. Over."

TWA: "I'm not going to change over. I'm going to leave 14,000. I asked you a simple question. I want an answer. Is 18,000 available?"

NY: "Negative. You have traffic at 16,000. Maintain 14,000."

TWA: "You get that traffic out of 16,000, I'm going up there."

NY: "Traffic is maintaining 16,000. Do you have a special reason for vacating 14,000?"

TWA: "I'm going to declare an emergency. You'd better get him out of there."

NY: "Why are you vacating 14,000? Are you declaring an emergency?"

TWA: "I asked you if 18,000 is available. I want to know."

NY: "You can climb VFR to 18,000. It's available."

TWA: "Is 18,000 occupied?"

NY: "Negative."

TWA: "OK, is Capital 31 maintaining 16,000?"

NY: "TWA 19, maintain 14,000 unless you are declaring an emergency."

TWA: "Okay, I'm declaring an emergency and I'm leaving 14,000."

NY: "Roger, you have traffic above you at 16,000?"

CAPITAL 31: "Did TWA leave 14,000?"

NY: "Capital 31, stand by. TWA 19, have you left 14,000?"

TWA: "TWA 19 is leaving 16,000 right now."

NY: "Which aircraft is vacating 16,000?"

TWA: "TWA 19 is."

CAPITAL: "N.Y. center, this is Capital 31. We're reversing course at 16,000."

NY: "Capital 31, understand TWA 19 has left your altitude."

CAPITAL: "I just saw TWA come right through my altitude, off to the left. I want to know why he did it."

NY: "Capital 31, TWA 19 went right up through your altitude with no clearance."

TWA: "TWA did it because traffic control refused to vacate you out of it and advise you."

CAPITAL (to TWA 19): "Do you want to run into somebody? You didn't miss me by very much."

TWA: "What was my heading when you saw me?"

CAPITAL: "My heading was 300° and yours on about 280 or 275."

TWA: "That's right."

CAPITAL: "What was the emergency you declared?"

TWA: "I gave him 8 min. and he refused flatly to do it."

CAPITAL: "You never gave him 8 min. to move us out of the way."

TWA: "He couldn't contact you."

CAPITAL: "N.Y. center, this is Capital 31. Do you have a transcription of all this?"

NY: "Affirmative, Capital 31. It's all recorded."

On Mar. 12, Barney Oldfield, controller and James Boyle, watch supervisor of the NY Center were called to Washington to make depositions on the incident at the request of Geo. Archer, ALPA attorney representing the pilot, Capt. Specht. The formal hearing before CAB commenced in N.Y. Mar. 18 and is being continued in Kansas City.

Allison Test Pilots Conduct Propeller Icing Tests

Allison (Prop-jet engines and Aeroproducts propellers) test pilots in Indianapolis have made research flights simulating extreme icing conditions and report that only a 4% loss in propeller efficiency resulted from typical ice formation. The general aviation industry for years has accepted a 14% loss as a figure.

Numerous speed-power flights were made without ice configuration to establish an accurate base-line for comparative data. Later, a special polystyrene plastic block was affixed to the leading edge of each propeller blade and then carefully hand-carved to simulate extreme ice formations. Photographs of actual iced propellers were used as a pattern for the polystyrene carvings. The Turbo-Liner (Convair with Allison Turbo-jet engines and Aeroproducts props) was then flown through the same patterns under identical engine-propeller operating conditions. Although no specific airplane performance data with the iced propellers were taken on takeoffs and landings, the pilots reported that only mild roughness was present and no noticeable loss in performance was recognizable.

De-icer boots on the leading edges of propellers, standard equipment on transport type aircraft, have been measured to cause an efficiency loss of 2%, which of course is present at all times. This 2% loss represents one-half of the loss due to extreme icing conditions without boots. Extreme icing conditions are encountered only 5% of the operating time.

Although the 4% loss is small compared to the accepted 14%, the Allison test pilots were quick to point out possible aircraft damage might arise due to ice slinging and possible propeller imbalance. However, any unsymmetrical ice loss from any one blade would result in immediate propeller rotational imbalance, thereby causing the remaining blades to shed their retained ice. Their findings to date will be turned over to CAA, the airlines, and airframe manufacturers for additional review.

Safety Notes

Tricycle Gear Down for Rough Landing

"The Chief of Naval Operations advises all pilots to note this well:—when forced landings on unprepared terrain are unavoidable, jet or other tricycle-geared aircraft should have their gear *DOWN*." *—"AIRPAC"*

Cuttrell Receives 1st ALPA Safety Award

"Captain E. A. (Ernie) Cutrell, AAL senior pilot, was awarded the 1st Annual ALPA Air Safety Award at the ALPA Safety Forum in Chicago in March.

"Cutrell received the award on the basis of his work in developing the center-line, condenser discharge type of approach lights that increase both the efficiency and safety of operations by providing pilots with better guidance to the runway in instrument weather.

"He learned to fly in World War I and soloed in 1918. He received transport rating #70 in 1927. He joined AAL in 1934 and is still actively flying.

"In the 1920's as an inspector for the old Civil Aeronautics Authority, from 1927 to 1933. Cuttrell developed the instrument flight rating and the original air transport rating for the Department. He was a pioneer of what was once called "blind flying" and had a hand in developing the instrument landing system now known as ILS." *—ALPA*

Coordinate Rules on Ag-Flying

In a 5-point program to tighten up safety precautions in low altitude agricultural or pest control flying, CAA Administrator James T. Pyle, at the 6th Annual Agricultural Aviation Conference at Texas A. & M. College. pointed out that growing public sensitivity to the hazards of such specialized flying could bring on a hodge-podge of widely varying regulations in the 48 states.

Therefore, he proposed that within the framework of the CAR waivers currently required for this work, specially qualified CAA inspectors will examine each proposed operation, will re-

strict single-engine operations so as to permit "glide to a safe area in case of engine failure," restrict multi-engine planes to "weights permitting continued flight and climb in case of engine failure," dump valves of "10 seconds" capability, takeoffs "away from congested areas," and finally "special qualifications (largely experience) for pilots working over congested areas."

Mr. Pyle pointed out that many "aerial application" operators feel that establishment of Federal regulations devised in co-operation of the industry and government would enhance the safety, reputation, insurance aspects of their operation and forestall the aforementioned "crazy-quilt pattern of 48 different sets of regulations."

—Dept. of Commerce

West Coast Pilot Information

Santa Barbara

LF Range "SBA" 350 kcs. has been noted as being subject to night-time interference from San Francisco Locator radio beacon "SF," 350 kcs., and Miramar NAS radio beacon "NKX" 353 kcs. Pilots are advised to be careful of inaccurate bearings when flying over this route at night.

Oakland, Los Angeles, and Seattle ARTC Centers

In addition to 118.9 and 120.3 mcs; available at all centers, Oakland Center now 124.1, 124.5, 125.1, and 125.9 mcs. Seattle Center now transmitting 120.7 and 125.3 mcs. from a peripheral site at Portland.

San Francisco Weather Broadcast

San Francisco overseas weather broadcasts at :05 and :35 past the hour on 2980, 5574, and 8905 kcs. have been expanded to cover reports from San Francisco, Sacremento, Seattle, Portland, Los Angeles, Riverside, Fairfield and Oakland.

Radar Departures

It is necessary to change over to Radar Departure Control as soon as possible when taking off from any major airport with radar facilities. This procedure is necessary to assure radar separation from preceding departures.

One Thousand On Top Clearances

Many of the airlines have been affecting a new change in their procedures. When an ATC clearance includes the phrase "at least 1000 ft. above all clouds," they are adding 1000 feet more for grandma. These airlines feel it to be a safer procedure to fly 2000 ft. above all clouds when their clearance requires them to fly on top. The CAA is considering changing the regulation to this and, in the meantime, to remain "at least 2000 ft. above all clouds" appears to be a safer habit.

"Keeping Aheadiness"

A source of complaints from tower operators is that pilots come into their control and ask for the latest weather within two minutes after it has just been given. If pilots make it a practice to set up frequencies ahead of time, they can save a great deal of time and, perhaps, extra transmissions. When the tower gives the local weather they can copy it. The tower briefs an incoming flight on the runway and wind direction. A pilot who has his radio sets working for him can get more utilization by keeping ahead of the game.

Emergency Radar Assistance

It is not anticipated that any executive aircraft will lose orientation or otherwise become lost in flight; however, it is possible under certain combinations of situations. Procedures have been developed to use military and civil radar installations in such emergencies. These procedures are in effect in the U.S., Alaska and Pacific areas where radar coverage is available for air defense or air control. These procedures are as follows:

If lost—Climb for the best radar pick-up.

Receiver working—1. Switch to 121.5 (VHF). 2. Fly a triangular pattern to the *Right* 120° ½ needle width turns. *Two* min. legs. Fly *two* orbits. 3. Wait for instructions from Radar Controller. and follow them.

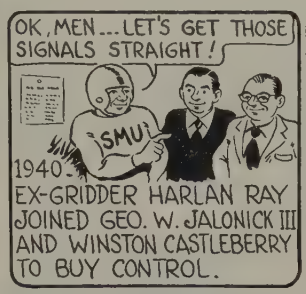
Receiver Out—Fly triangular pattern to the *Left*. Wait approximately 20 min. for interception. If at night, put running lights on *Bright*. After 10 min. Landing Lights *On*, if possible.

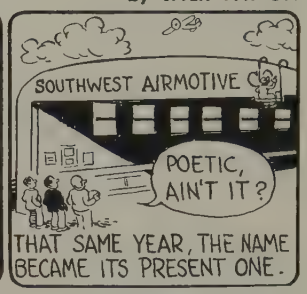
When Intercepted—1. Attempt radio contact if possible. 2. Get in trail formation with escort. 3. Attempt to maintain 160 knots.

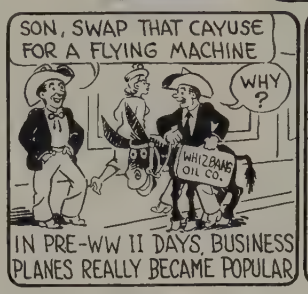
What Interceptor Will Do—1. Put running lights on *Steady* and reduce speed for formation. 2. Inform controller of contact and follow instructions. You follow him. 3. If he turns

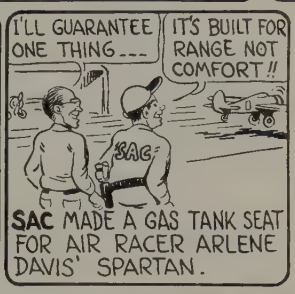
SAC Silver Jubilee Newsreel

by JACK PATTON

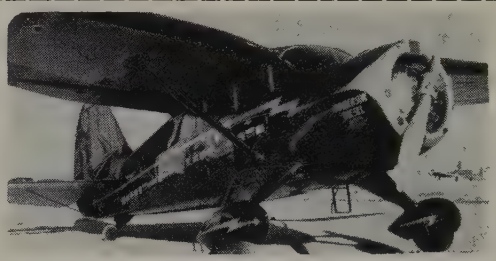

OK, MEN... LET'S GET THOSE SIGNALS STRAIGHT!
SMU
1940- EX-GRIDDER HARLAN RAY JOINED GEO. W. JALONICK III AND WINSTON CASTLEBERRY TO BUY CONTROL.

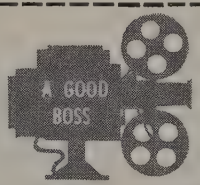




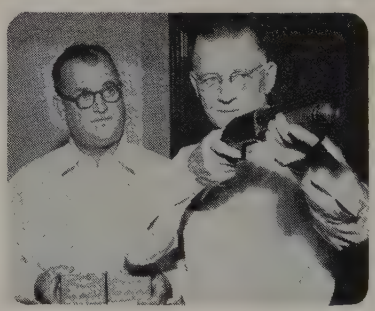


Good ideas long have characterized Southwest Airmotive and those with whom it deals. Guiberson Corp.'s radial Diesel engine powered this Gull Wing Stinson in pre-WW II experimental flights throughout the Western Hemisphere.





Winston Castleberry's first loyalties are for customers and for the craftsmen who, since the '30's, have worked so closely with him in his role as a SAC owner and service boss. Here, he presents an anniversary gift to Hunter Louis Beimer, Engine Division chief.



1932 A QUARTER CENTURY OF LEADERSHIP 1957

Southwest Airmotive Co.

LOVE FIELD DALLAS

DIVISIONS: KANSAS CITY, KANSAS / DENVER, COLORADO

his lights from *Steady* to *Blinking* for 15 secs., then breaks formation with lights *Blinking* (at night) or rocks wings (day), continue *On Course;* escort must leave. 4. If he turns his lights from *Steady* to *Blinking* for 30 sec., then back to *Steady* and breaks formation with lights on *Steady* (night) or fishtails (day), reassume the *Distress Orbit.*

It is important to note that this system is set up to assist only. It is the last chance to avoid disaster. Use it before it is too late, and remember, you can be picked up only if you are within range of the Radar.

Airline Pilots Talk Safety

Crash helmets, lightweight protective headgear designed to look less like the "man from Mars" than the familiar jet helmet; and practical comfortable shoulder harnesses: These were some of the items discussed at the 3-day Safety Forum of the ALPA at Chicago in March. Hi-density zone designation for Dallas-Ft. Worth area with other improvements (sic) were also on the agenda.

The reference to protective headgear and shoulder harness was featured in an address by A. Howard Hasbrook, Director, Aviation Crash Injury Research, Cornell University. Mr. Hasbrook, speaking on Crash Safety Design of Flight Crew Stations, cited 3 instances out of many wherein cockpits remained intact, but severe or fatal injuries to pilots were sustained due to lack of headgear, harness or other adequate crew protection gear.

As he points out, this gear can be designed to meet safety needs for takeoff and landing as well as anticipated emergency landings without alarming the passengers, a factor of interest to corporation aircraft crews whose cockpit privacy is more frequently violated by curious passengers than that of airline crews.

The remarks about the Dallas-Ft. Worth area originated from Capt. Harold Miller, AAL Member of the regular ALPA Air Safety Panel. Capt. Miller, in describing the work of the ALPA Regional Air Safety Committees, pointed out that ALPA participation in Regional Airspace Subcommittee meetings, held by CAA in all critical parts of the country, has produced support and action in improving many of the dangerous bottlenecks in certain areas. He indicated that the Dallas-Ft. Worth area is one of these because of the mixture and congestion of all types of aircraft in that area.

The establishment of VFR Corridor procedures there has already helped minimize the conflict between east-west shuttle traffic, Love Field to Amon Carter, and the jets taking off north from NAS Hensley Field. The establishment of a Hi-Density Zone will follow the procedure being established now to require all traffic to contact Approach Control at both civil fields, plus radar at Carter. IFR procedures in marginal VFR conditions now are unpopular with pilots because of unacceptable delays. A shuttle flight that can be made VFR in 3 to 4 min., or in 20 min. by car. takes up to 1½ hrs. IFR planwise!

Capt. Miller further reported on the need for a procedure that doesn't shut down back-course ILS approaches at Carter whenever jet penetrations are in progress at NAS Hensley. In a humorous vein, he demonstrated that Center line, Configuration A Approach lights for Love Field awaits only on the cooperation of the tenants in the local airport community, referred to as "V_2 Village," through whose bedrooms the last 300′ of the lights would necessarily go! PAR early commissioning was mentioned as was the addition of a welcome 800′ on the N. end of Runway 17-35, plus extending the NW-SE runway to 8500′, and adding a parallel runway of similar length.

Theo. G. Linnert, Head of ALPA Engrg. and Air Safety Dept., pointed out the virtues of ALPA's "volunteer" participation in airline crash investigations. Both to lend their undoubted technical knowledge as well as to protect the interests of the "brotherhood of airplane drivers," many airline pilots, either by agreed designation or voluntary initiative, will proceed, according to their relative proximity and often by personal means, to the scene of an airline crash. There, they identify themselves to the appropriate CAB and CAA representatives and other officials in charge at the scene, and offer their services, which are rarely, if ever, declined. If a voluntary appearance due to closest proximity, they yield to the duly-designated ALPA investigative member for the general area upon his appearance.

The advantages of this procedure are obvious and other pilot organizations would be well advised to give sober consideration to it, especially in view of the CAB's most recent ruling on accident hearings *re:* participation of interested parties. Capt. David Halperin, TWA, also touched on this subject, expressing dissatisfaction with many of the CAB's accident hearing reports. He spoke for separate and parallel investigative procedure on the part of ALPA.

The airline pilots are still not satisfied with cockpit visibility in even the latest aircraft, as pointed out by Capt. Robert Adickes, also TWA. He reports that, among other items submitted by the Engrg. and Air Safety Dept. of ALPA, to the CAB Annual Review for 1956, were:

1. Better (and more) emergency exits; 2. Better emergency lighting; 3. Shoulder harnesses (as a requirement); 4. Landing gear operable by either pilot (sic); 5. Turbo-prop drag limiting system; 6. Fuel tank protection; 7. Fuel dumping provisions; 8. Auto-pilot protection devices; 9. Turbo-prop blade position indicator; 10. Electrical load monitoring system; 11. Landing light position indicators; 12. Life raft location.

Of considerable interest in Capt. Adickes' remarks was his committee recommendation against gust locks in the new Convair 880 Jetliner and substitution of control rate damper devices.

Not to be outdone, the CAA's Deputy Director, Office of Air Traffic Control, Henry S. ("Red") Chandler broke out the crystal ball and let the ALPA gathering in on some of the efforts of CAA to provide early improvements within known and established developments. Control of all airspace at and above 24,000′ now being implemented, will be lowered by 1958 to 15,000′. All such traffic will by then be able to be in direct pilot-to-controller contact, a must for the jet age.

The current 416 VOR's now in operation will be supplemented this year by 82 more and about 200 of the total will be integrated with TACAN equipment, with 1200 such as the goal for 1965. In speaking of discontinuing the use of the L/MF airways for IFR use, and "early decommissioning of the L/MF system," Mr. Chandler did not clarify whether he was implying that they would remain available for low altitude VFR use where VOR coverage is still notoriously weak!

"More and more radar" as already promised by Mr. Pyle, CAA Administrator, was defined in more detail by a statement that all "hi-density" locations will have long-range radar by late 1958, plus radar coverage for the High-Altitude Control now going into effect and by 1958 at 15,000′ and above. Anti-storm effect and daylight displays are "just around the corner," with identification displays facilitating the ground controller's operations and thus increasing his capacity to handle more traffic. Air traffic control radar beacons are currently scheduled for N.Y. and other Centers by July 1. 1957, and so both airline crews and executive crews investing in the airborne equipment will have assurances of both practical use and early participation in the advantages of these devices.

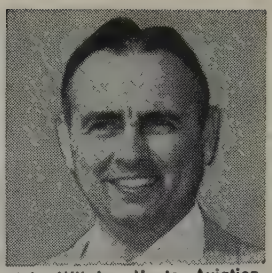
The final pot of gold in the CAA's crystal ball picture is the happy progress toward the use of automation and computors. Both for air route processing, a task which now consumes a majority of a controller's time on purely clerical functions, and for automatic approach feeding, VOLSCAN is going into a service test phase. The big block still seems to be sufficient and adequate new ATC personnel. Recruiting of good-potential people is being pushed country wide, and the ALPA delegates were urged to interest themselves individually in this program.

As a corollary effort, in attendance at the forum, were co-representatives from CAA and Flight Safety Foundation, engaged in a survey project to examine the physical standards of pilots and airways operations personnel in the light of up-to-date modern requirements. Data sampling from all cross-sections of aircrews, professional and non-professional, and of ATC people in all catagories of facilities and geographical areas is under way. The resultant information will be placed before an assemblage of the best available aviation medical experts,

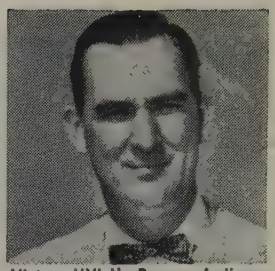
Don Vest, Vest Aircraft & Finance Co., P O Box 5306, Sky Ranch Airport Denver, Colorado

W H "Bill" Buchanan, Sales Manager, Johnson Air Interests, Inc., Horlick-Racine Airport, Racine, Wisconsin.

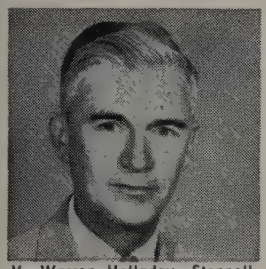
Peter Graves Southern Ohio Aviation Sales Co., Dayton Municipal Airport Vandalia, Ohio



John Wilsdon, Hunter Aviation Co., P O. Box 122, Lambert Field, St. Louis, Missouri.



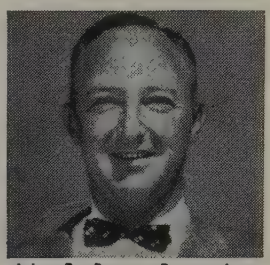
Victor "Vic" Bruce, Indianapolis Executive Aircraft Corp., Indianapolis Municipal Airport, Indianapolis, Indiana



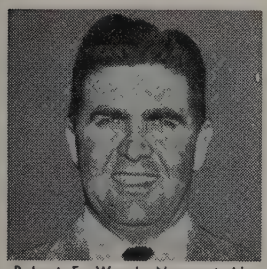
H. Warren Holladay, Stonnell and Holladay, 843 Washington Building, Arlington Towers, Arlington, Virginia

A. M. "Sime" Bertolet, Reading Aviation Service, Inc., Municipal Airport, Reading, Pennsylvania.

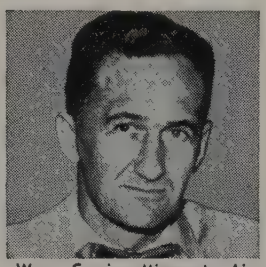
H Leibee Wheeler, Buffalo Aeronautical Corporation, Buffalo Municipal Airport, Buffalo, New York.



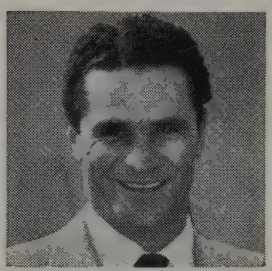
John S. Brown, Brown Aero Corp., 3300 Love Field Drive, Dallas, Texas.



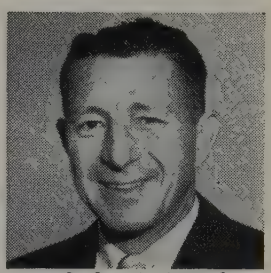
Robert F Wood Newport Air Park Newport Rhode Island.



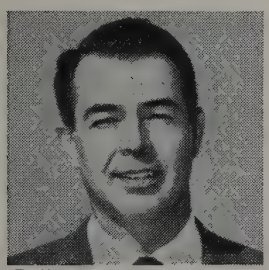
Wynn Cronje, Minnesota Airmotive, Inc., Minneapolis-St. Paul International Airport, Minneapolis, Minnesota.



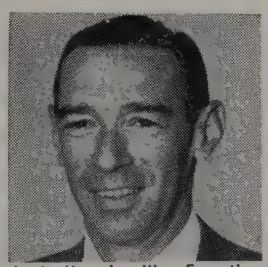
Norman Hoffman, West Texas Flying Service, Midland Airport, Box 82, Midland, Texas.



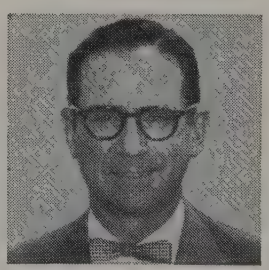
Max R Brand Aero Commander Dist. (Downtown Airpark), Hangar 3, Municipal Airport Tulsa, Oklahoma



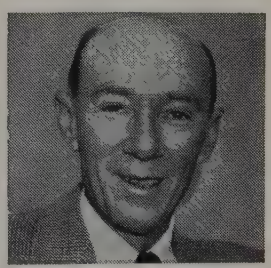
E H. "Ted" Tolan, National Aero Sales Corp., Midway Airport, Chicago Illinois



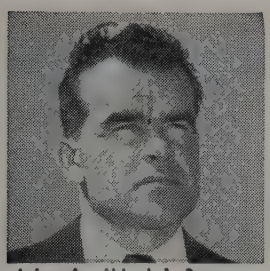
Louis Humphreville, Executive Aircraft Corporation, Municipal Airport, Pontiac, Michigan



W. D. Maddox, Aero Southern Corp., 601 North Broadway, Nashville, Tennessee.



O. B. Callan, Fairfax Aviation, Inc., 3301 Fairfax Trafficway, Fairfax Airport, Kansas City, Kansas.



John A. "Jack" Bauman, Santa Monica Aviation, 3011 Airport Avenue, Municipal Airport, Santa Monica, California.

Herrol Bellomy, L B Smith Aircraft Corp., Miami International Airport, Miami, Florida.

Lucien M. Taillac, Trans-Aire Corporation, Pan-Air Building, New Orleans Airport, New Orleans, Louisiana.

Jack Gregg, Northern Aircraft Co., International Terminal Building, International Airport, Oakland, California.

Robert M. Brown, Commander Sales Company, Terminal Building, International Airport, San Antonio, Texas.

NATION-WIDE SALES and SERVICE

AERO DESIGN Commander

AERO DESIGN AND ENGINEERING COMPANY

TULAKES AIRPORT • OKLAHOMA CITY, OKLAHOMA

physiologists, specialists in heart, eyes, hearing, etc., psychiatrists and industrial medicine. Their considered findings, aided by personal observation in both the piloting profession and the airways operations field, may bring to light many facts now only hinted at, such as physical tenure of safe piloting life or safe earning span in an airways operations specialist's career, etc.

Radar "Flares" For Light Aircraft?

One of the more distressing factors in radar handling of either a light-twin business aircraft or a "lost" private plane tying up ATC terminal procedures in IFR weather is the inadequacy of the normal radar return or "target" of such aircraft.

Civil radar beacons in their earliest available "off-shelf" form will be of such weight, size, and cost that they will make their appearance only in air carrier or similar category large business aircraft. The comparatively small percentage of the lighter business aircraft flying "heavy" IFR weather further restricts the development market for lighter ATC beacons.

Hence, the suggestion of an unidentified "airline pilot" that metal foil products which were dropped out of aircraft during the war to jam enemy radar might make possible good identification of an aircraft position whose normal radar return is too light to be positive. A packet of such material carried in a similar manner to the old "unconfined shot, sand or water" ballast of old days or overwater emergency packets of dye marker material could easily be dropped out of an aircraft upon request of a radar controller and greatly aid the identification and subsequent handling!

"ATR" Suspended for "Carrier Approach" Crash

On Feb. 17, '56 an airline Martin 404 with 20 passengers on board, ended up on its back at Owensboro, Ky., Airport. Although no serious personal injury was reported, the right wing was torn off at the root and other major damage sustained. The Captain's Airline Transport Rating was placed under emergency suspension by the CAA Administrator from Mar. 9 to May 7, during most of which period he continued flying as a co-pilot.

CAA alleged that the pilot, in the conduct of his approach, violated CAR 60.12 (Careless and Reckless Operation - - -) and CAR 40.18 (Descent below safe minimum altitude unless the aircraft has arrived at a position from which a *normal* approach to a landing can be made - - -).

The accident occurred when, after completing an instrument flight from Evansville, Ind., the pilot, having located himself over commercial broadcast station WVJS, 1.9 mi. N. of the airport, proceeded to let down on a heading of 194° magnetic, breaking out of the overcast N. of the field. Having sighted the field, he elected to land Runway 5 and commenced a right turn to the S.W. to enter a downwind leg heading of about 250°. Wind being negligible, this produced a flight path only 20° divergent from Runway 5. The CAA contended that the aircraft was only about ½ mi. distant when abeam the approach end of the runway, the captain maintains it was about 1 mi. The CAA, on the basis of ground and airborne witness testimony, further contends that within 10 sec. or less, he started a descending "U" turn to the left to land Runway 5. The left turn was completed but the aircraft struck the ground at a point 330′ short and 125′ S. of the runway.

The pilot testified that, when he broke out about 1 mi. N. of the airport, he made his initial right turn completing it while still 1200-1400′ N. of Runway 17, and entering downwind leg more than a mile abeam Runway 5. After then passing the approach end, he started a 30° bank and held it until within 45° of the runway heading, at which point the bank unaccountably steepened. He testified that he still had an altitude of 400-450′ at this time and that with the co-pilot's help he raised the down wing and applied power. After recovery at about 300′, and while descending on a heading of 5° left of the runway, wings leveled, about 5 to 7 sec. later the right wing dropped without warning. While attempting to raise the wing and lift the nose, the ground contact occurred.

Two ground witnesses (a 3rd offered contradictory evidence) testified that the turn into downwind leg was made over the airport. After the accident, the pilot himself told a CAA agent on the scene that he "came over the end of the N. runway (17)" and *then* made a right turn "into his downwind leg paralleling Runway 5." Calculations based on this self-supported witness testimony placed the downwind leg about 2000′ abreast of the runway.

The investigation developed passenger as well as ground witness testimony plus physical evidence at the crash contact point to indicate that a continuous descending left turn was executed with an increasing rate of bank until it rolled to the right and struck the ground. As to the 5° final left variance from the runway heading, the crash marks indicated a 20° left variance, suggesting a considerable overshoot of the turn to the right of the runway centerline before ground contact ended the flight path.

The CAB Examiner who conducted the original hearing, found that "the approach was proper in type but 'marginal' in execution," but not so faulty as to warrant disciplinary action, or that possibly the aircraft's attitude was affected by vagrant wind gusts.

Expert testimony as the conduct of such an approach indicated that it *could be* initiated from over the field, but with a downwind leg of not less than 270° in this instance, resulting in a substantially wider base leg. However, testimony of witnesses for the pilot did not indicate that they would have executed the approach in the manner in question. In addition to charging that a landing was attempted from a position that required abnormal and unsafe maneuvers of the aircraft, CAA also challenged the pilot's judgment in attempting to land on a wet short (3700′) runway with an approach that called for a continuous turn until just short of the runway threshold.

Martin Co. expert witness testified that whereas "from a steep bank, with the addition of power, the aircraft will have a tendency to roll out and straighten up" and that any stall would be preceded by buffeting (which the pilot contends was not present), "if the stall was started in a steep bank, it would roll . . . if it were a co-ordinated turn it would roll level and possibly *roll on* the other way."

At least one passenger witness testified to buffeting in the last part of the turn. The wind gust theory was based on some ground witness reports of lightning and thunder in the S.W. quadrant from the airport. Neither the pilot, prior to his appeal of the Examiner's findings ("marginal execution of the approach") nor Weather Bureau forecasts, reports, or any other testimony sustained the thunderstorm theory. In any case, the CAA maintained that, even in the presence of such wind phenomena, a reasonably prudent pilot would have realized early enough in the approach that a safe landing was in quesion and exceuted a missed approach. Also, at the calculated landing weight of the Martin at the time of the approach, an immediate touchdown at the very approach end of the runway might not have placed the operation within legal limits, even on a dry runway with a standard approach. CAA argued, in the proceedings subsequent to the appeals entered by both the pilot and CAA against the Examiner's original finding, that "revocation of the air transport rating is appropriate; . . . . a captain who flies his aircraft to destruction under the conditions established by the evidence in the record cannot be left with command authority if the public is to be protected" and that such "revocation would not exclude him from aviation or deprive him of his livelihood, but will place in other hands the responsibility for the safety of passengers."

The CAB Board concluded that whereas, "to fail to impose a sanction would tacitly condone a course of action which, even if no accident had resulted, would have brought an aircraft to within inches of disaster", the pilot's record of 11 yrs. as a captain and over 8000 hours without a previous incident or any disciplinary action for violations of safety rules, did not in this instance warrant revocation. It felt that the accident itself, together with a substantial suspension of his ATR, would provide a sufficient deterrent against him or other pilots taking similar risks with their passengers' lives. Accordingly, a 6 mo. suspension, with credit for the 60 days already imposed, was ordered, and the pilot required to take an appropriate flight check given by the CAA prior to again exercising the privileges of the rating.

In the Jump Seat

Some of our top-notch business pilots take us along and share the sweat AND the fun! Our contributor is again Torch Lewis, ace throttle-jockey of Thatcher Glass Co's Lockheed Ventura. May we come along with you?

Baltimore

The peons were gathered from miles around to see Tex Johnson bring in (and paint on) the Boeing 707 from Seattle in 3 hrs., 48 min. We had a front and center for the festivities by virtue of the fact that, "We write for SKYWAYS." It was only a white lie because we have *written* a few articles. Tex finally appeared and roundly bussed the 3 airline hostesses who had made the trip so pleasant. They then thanked him for that *lovely* demonstration of the A-12. Tex's copilot got bussed too. I was 3rd in line by this time, but they only shook hands and said, "Hope you enjoyed your trip, Mr. Hitchcock." An alert photographer then snapped me (see cut) but later I found that WILBROD, my co-pilot, had slipped the fotog a finif for the job.

Miami

Good gawdamighty but this place is busier than the one legged man at the butt kickin' contest. What between dual runways with left and right hand approaches to each, plus I always arrive over a checkpoint at eggzackly the same time as 4 other guys, none of which I can see. I can hear 'em all yackin' pretty good though, but from what I can *see*, I think some of 'em are inclined to be loose with the truth on the ole position report. Over the outer marker I can hear a VFR DC-7 "requesting traffic as we are in a light rain shower." Loosely interpreted, this means, "All you guys stay the hell outa here as we are in the sauce and on the clocks."

For the very very uninitiated few who, having been to Miami, have not been to the Miami Springs Villas let me say that here is a pilot's haven, second to none. Ask the man who's been there. Art Bruns is very very friendly to visiting airmen, as it was largely their kind words what got the thing going.

Varadero, Cuba

Eight thousand ft. of sea level runway welcomes your eyes after 120 mi. over the shark and barracuda blue waters of the Caribbean. Just as you are reasonably sure that your compass has been playing tricks and in only 4 more min. you will be over the Amazon, there is Varadero.

Varadero boasts one of the world's most beautiful beaches. The Internacional is a large modern hotel smack dab on the sand, filled with rococo *objets d'art* largely the collection of the recently demised American owner. They also have roulette, blackjack, gallopun dominoes and bingo.

We prefer a small place called "Happy Pete's", long on hospitality and filled with nice people who come back year after year. "Pete" is a Greco-Cuban who speaks 8 languages, none of them very well. The tab is 14 clams per day, which includes 3 passable meals and no extra charge for the sand in your bathing suit. Best way to avoid the 'green apple two step' in Cuba is to stick to *Añejo* (old & rare) and *Cerveza* (beer). There is a boite called El Castillito which will stay open with the orchestra until the last customer leaves even if it is the day after tomorrow.

Cuba is well worth the price if you don't mind an occasional revolution. It's even worth missing a N.Y. Regional NBAA Meeting, which I did.

(Continued on page 43)

***for the finest in business-pilot training or for the best trained business pilots ...contact* EMBRY-RIDDLE!**

● It's only natural that Embry-Riddle, America's pioneering, best known school of aviation, trains outstanding business pilots.

The two-year Business-Pilot course offered in conjunction with the University of Miami, fully qualifies the Embry-Riddle graduate for his choice of aviation's most responsible positions—both on the ground and in the air.

Whether a beginner or a commercial pilot seeking higher ratings, the complete, well rounded curriculum provides the broadest possible background in a wide range of technical aviation phases ...plus basic business and management education necessary to success in any management or aviation executive career.

In addition to the Commercial, Instrument and Multi-Engine ratings, the thorough Embry-Riddle flight curriculum incorporates all essential training for the long range flying conditions which will be encountered by the corporately employed pilot. Experienced instructors, modern aircraft, advanced Link trainer equipment, and latest instruction methods insure the best qualification for each student.

WRITE TODAY FOR FULL INFORMATION!

FOUNDED 1926
Embry Riddle
AERONAUTICAL INSTITUTE

DEAN OF ADMISSIONS, Dept. 33
Embry-Riddle School of Aviation, Miami 30, Fla.
I am interested in
☐ enrolling in the Business-Pilot Course
☐ employing an Embry-Riddle graduate

Name (firm).....

Address.....

City.....State.....

(for students only) age..... (check one) vet ☐ non-vet ☐

MAINTENANCE

Narco Bulletin Cites Sapphire Fuse Failures

National Aeronautical Corp. has issued a service bulletin on the failure of Ledex fuses which has been found to occur in Sapphire 1016 units with serial numbers below 1061.

According to the bulletin the trouble has been traced to the Ledex channeling mechanism driven gear tooth spacing and associated tolerances. As a result of tolerances on the parts which support the driving gear of the Ledex assembly, the driving gear has a random tendency to lock itself into a tooth preceding the tooth into which it should normally lock for the next "throw". This problem has been solved by reducing the angular throw of the Ledex shaft from 25° to 20°.

The condition is confined exclusively to units with serial numbers below 1061, with no such failures reported in later-numbered units. The condition also manifests itself more significantly in units operating at 24 volts, somewhat less in those operating at 12 volts.

Narco has modified about 38 of the units which display this phenomenon. Distributors are urged to inspect each unit that comes to their attention so that it may be returned to the factory to eliminate fuse blow-out condition and bring performance up to present standards.

World's Largest Maintenance Hangar Under Construction at Oakland

What is reported to be one of the world's largest aircraft maintenance hangars is under construction at Metropolitan Oakland International Airport.

Designed to accommodate the largest aircraft in operation today, as well as those planned for the foreseeable future, the hangar is being built by the Port of Oakland at a cost of $1,250,000 for lease to Aircraft Engrg. and Maintenance Co., a subsidiary of Transocean Corp. of Cal.

The first unit of the structure is scheduled for completion in July; it features the largest cantilever span in the U. S., 160′ without intermediate support, to provide an entrance doorway for aircraft. The completed hangar will enclose 135,000 sq. ft. Maintenance operations in the hangar will be carried on by production line techniques.

CAA Offers Bulletins On Plane Maintenance

Airplane owners can now obtain General Maintenance Inspection Aids and Alert Bulletins from CAA through a new subscription plan recently announced.

The Aids deal with the service experience of general aircraft and are issued monthly, with an annual summary. They are compiled from information received from the industry which regularly sends in Malfunction and Defects reports to CAA. The Alert Bulletins point to specific conditions that require emergency action by owners and repair stations.

All Alert Bulletins issued during the year, 11 Inspection Aids and the Aids Summary will be mailed to any subscriber by the Supt. of Documents for $1.50 a year.

NBAA Offers AD Preview

NBAA now offers to its members the opportunity to examine in advance and make recommendations on CAA's proposed Airworthiness Directives (AD notes).

NBAA members will be sent every proposed AD note concerning the type of aircraft they are operating and which are now listed in the NBAA Directory, revised Feb. 1957.

Members will be asked to review the proposed AD notes and to make suggestions regarding them or to make recommendations regarding CAA corrective measures. Suggestions or recommendations should be forwarded to Mr. W. H. Weeks, Chief, Aircraft Engrg. Div., CAA Bldg T-4, Washington 25, D. C. A copy of the letter should also be sent to NBAA for follow-up.

This preview will also give members advance information on possible malfunctions and trouble areas, and suggested corrections.

"No Delay Expected"—via NAS and Lincoln Tunnel to Manhattan

The most irritating factor in Business air transportation into the New York area is excessive air traffic delay in landing and in travel from the airport into mid-Manhattan. Only 20 min. from Manhattan, according to Carey Coach Co., is Newark Airport, and one of its newest fixed base operations is Newark Air Service.

Active in the aircraft service field since 1927, Newark Air Service's new facilities at Newark Airport are a good example of the efforts of fixed base operators to make their headquarters as modern and efficient as the business aircraft they serve.

As a subsidiary of the Lehigh Warehouse and Transportation Co., Newark Air Service has a background of 35 years' experience in reliable service. In order to keep this tradition up to date, one of the first undertakings at NAS in preparation for their move on Jan. 1, 1957 into new quarters was a modification of Hangar #12. Originally accommodating aircraft up to DC-3 size, the hangar was enlarged to an area of 43,000 sq. ft., and can now accommodate aircraft up to and including DC-7's.

New buildings on the southeast side of the hangar house NAS reception rooms, offices, shops and storage facilities. Designed to carry on the comfort and convenience of modern executive aircraft, the bright, modern waiting room adjoins a conference room where busy executives can make good use of every minute of enroute time. A self-service coffee shop is nearby. Continuous teletype messages keep pilots posted on national, regional and local weather conditions.

Newark Air Service is a 24-hour-a-day, 7-days-a-week operation. Shifts for the 60 staff members are staggered to insure full service at peak hours. When an aircraft is brought in for servicing its requirements are immediately recorded. Mechanics are assigned to the job through loudspeakers spotted throughout the facility, and progress reports on each job are prominently posted in the shops.

NAS offers engine and airframe overhaul, maintenance services, interior and exterior cleaning and refueling. The CAA rating for NAS has recently been increased, and they are now authorized to do aircraft maintenance up to and including DC-4 type equipment.

Parts are stocked for immediate availability for DC-3, Lockheed, Beech and some models of Convair aircraft. Dave Steege, NAS Vice Pres. and Gen. Mgr., pointed out that one important immediate objective is the enlarging of parts and supplies inventories to accommodate a wider range of business aircraft.

Variety and capacity are important to NAS because its proximity and convenience to New York make it a natural focus of corporate aircraft operations. Among the companies whose aircraft are hangared at NAS are Avco Mfg., Executive Aircraft, Esso Shipping, Manufacturers' Trust, Modern Air Transport, National Dairy, and Republic Steel. The list of owners of transient business aircraft serviced at NAS includes American Can, Continental Can, Ford Motor, General Foods, General Motors, Imperial Oil, National Steel, Phillips Petroleum, Triangle Conduit and Cable, and U. S. Steel.

NAS fueling and aircraft cleaning services are based on experience with

National, Braniff, Delta, N.Y. Airways and other scheduled airlines. NAS supplies Esso, Shell and Texas Co. aviation fuel in 80, 90, 100, and 115 octane. Volume sale of fuels at NAS has increased by 50% since March, 1956.

NAS has complete facilities for cleaning and freshening the interior of airline aircraft after each flight. This department offers cleaning and linen replacement services to executive aircraft as well. Exterior cleaning, equally important to airlines and business aircraft, is supplemented with Varsol spray, applied to nacelle and engine areas to cut oil and grease.

Convair 340-440 Show Constant Gain In Business Market

Orders for 21 more Convair *Metropolitan* 440 twin-engine commercial transports have increased the total number of these aircraft sold in the last 18 months to 146, of which 70 have already been delivered to private firms in the U.S. and abroad and to airlines.

Union Oil Co., which already operates an executive 340, has ordered a 440, also as an executive aircraft. Of the 146 aircraft ordered to date, 11 have been purchased by corporate customers.

Five Model 440's were purchased by the Civil Aeronautics Administration for flight inspection of airways facilities. The Brooklyn Dodgers baseball team has acquired a 440 to transport their Major League club and affiliated Minor League teams around their respective circuits.

NBAA Offers Company Aviation Policies and Operations Standards

To provide newcomers to business flying and present operators with information on current procedures and standards now in use by NBAA members, NBAA has compiled a file of *Company Aviation Policies* and *Company Operations Standards.* Information on either of these subjects is available free of charge to NBAA members or prospective members. The data should prove of great value to corporation executives considering aviation as a business tool, or to companies with aircraft who wish to improve safety or utility, or to expand their operations.

Caution Urged at Phoenix-Luke AFB

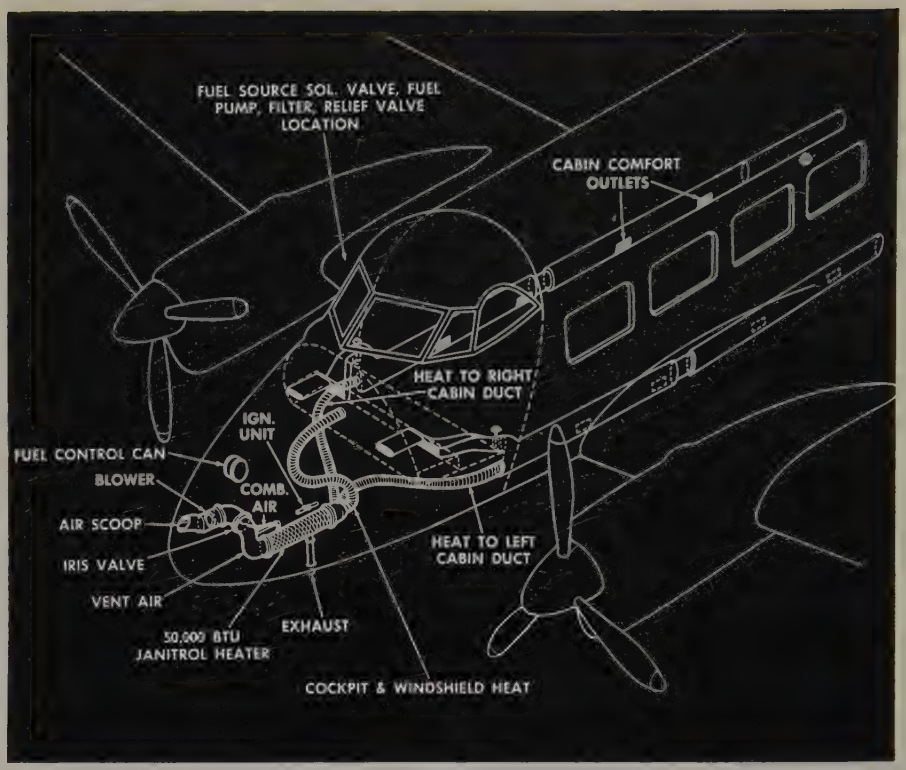
For all pilots who anticipate flying in the Phoenix—Luke AFB area, extreme caution is urged.

The takeoff and landing pattern used by jet pilots at Luke AFB cuts perpendicular across V-16, which is used by civilian aircraft for landing at Phoenix.

The Air Force has reported an average of three misses per week between Air Force jets and civilian aircraft.

The CAA has agreed upon a "floor" of 4500 feet for civilian aircraft.

The Air Force admitted that the Luke AFB—Phoenix area is one of the worst potential collision areas in the United States.



add Janitrol comfort to your Dove!

When the Hoover Ball and Bearing Company of Ann Arbor, Mich., wanted improved cockpit and cabin heat for their DeHaviland Dove, they took it to Ohio Aviation Co., at Vandalia, Ohio.

A standard Janitrol 50,000 Btu/hr heater was installed in the nose section. It attaches conveniently to the existing heat distribution system, and occupies little space.

Now passengers and crew enjoy extra comfort automatically maintained—both in the air and on the ground—regardless of outside temperatures. Windshield defrosting is provided and a blower supplies air to the heater for ground operation.

Whatever business aircraft you fly, the benefits of Janitrol all-weather comfort are great and the cost is small. Installations can be readily tailored to your needs from standard Janitrol heaters and components.

Janitrol Aircraft-Automotive Division, Surface Combustion Corporation, Columbus 16, Ohio.

COMBUSTION SYSTEMS • HEAT EXCHANGERS • PNEUMATIC CONTROLS

Janitrol

FLIGHT ENGINEERS

EASTERN AIR LINES' 425 MILLION DOLLAR PROGRAM INCLUDING TURBO-PROP AND STRAIGHT JETS REQUIRES ADDITIONAL FLIGHT ENGINEERS.

Eastern Air Lines offers you—

Security for yourself and family
Opportunity for advancement
Excellent pay
Broad insurance coverage
Many other excellent employee benefits

To qualify for consideration—

Citizenship: U.S. Citizen
Education: High school graduate
Physical: Successfully pass company flight physical examination.
Height: 5'8"-6'4" (without shoes)
Age: 23-32 (Will consider men up to 35 if experience exceeds that listed below.)

Experience: Must have four years diversified aircraft and engine mechanic experience. One year of this experience must be on aircraft with engine rating of at least 800 H.P. In addition, must be able to secure the CAA A & E license.

Preference is given to applicant holding any one of the following additional experience:

1. Holders of current A & E licenses.
2. Have 100 or more certified hours as flight engineer.
3. Have CAA commercial pilot's license with 200 or more certified hours.

Pay while training $330 per month. After training 1st year $500 per month with yearly increases up to approximately $950 per month.

For immediate openings, write detailing your personal qualifications, work experience and flight time to:

A. M. BEVERLY
System Chief Flight Engineer
Eastern Air Lines, Inc.
Box 787 Miami 48, Florida

Bearing Comparison

(Continued from page 13)

choose a heading that would intercept the track at whatever angle you wished. Once you reached the track, you would maintain your position along that track by turning to increase or decrease bearings in accordance with the system we have just outlined. You would not at any time after reaching the track be compelled to turn parallel to that track again in order to determine which way a correction should be made. The bearing comparison method would tell you everything you wanted to know.

"Now, how about the guy who does all this ADF work without an RMI? Do you recommend keeping the scale set to the compass heading all the way through the approach?"

Before we go into that one, let's have a word or two about the Radio Magnetic Indicator (RMI). The Radio Magnetic Indicator is an attachment to the fluxgate compass on which the ADF needle operates. The RMI is synchronized with the direction indicator of the fluxgate compass, and therefore acts and looks like another compass. Since the fluxgate is gyro stabilized and indicates accurately without the lag and turning errors of the ordinary magnetic compass, the RMI follows suit. The ADF needle, or needles, if a dual ADF is provided, are superimposed over the RMI card. The relative bearings of the ADF needle are then read directly as magnetic bearings on the RMI. This desirable feature completely eliminates all the fuss and bother of keeping the ADF scale set to the compass heading.

Even though you may not have RMI equipment with your ADF, once you have reached the desired track, there is a simple method by which you can calculate magnetic bearings without the necessity of resetting the ADF scale every time your heading changes.

When you reach the track, set the rotating scale to zero and leave it there. If the relative bearing is zero, your magnetic bearing, naturally, will be exactly the same as your magnetic heading. If the relative bearing is on the right side of zero (clockwise), add it to the magnetic heading to get the magnetic bearing. If the relative bearing is on the left side of zero (counterclockwise), instead of reading it as 350° or 340°, for example, read it as 10° or 20° *left*, and *subtract* that number of degrees from the magnetic heading to arrive at the magnetic bearing.

Suppose your heading is 330° and your relative bearing is 15° right. 330° plus 15° equals 345°, the magnetic bearing to the station. If your relative bearing on the same heading had been 350°, or 10° left, the magnetic bearing to the station would have been 330° *minus* 10°, or 320°.

If you're tracking away from the station, calculate your track away in exactly the same fashion, but use the tail end of the needle.

Suppose you're heading is 90°, and the head of the needle points to 190°, the tail would indicate 10°; 90° plus 10° equals 100°, your magnetic bearing away from the station. Had your relative bearing on the same heading been 165° at the head of the needle, the tail of the needle would have pointed to 345°, or 15° left. 90° *minus* 15° equals 75°, your magnetic bearing away from the station.

(Ed. note:) In reading Capt. Biven's very fine exposition, we can't help adding to it one little suggestion that we have also found helpful. Since omni flying has become so widely familiar, we find that to think in terms of an ADF equivalent to the VOR "radials" is most helpful. If you try Capt. Biven's "bearing comparison" method, and substitute "radial" or "track" for "magnetic bearing" the mental picture of the track you are on or crossing at any given instant, and its relationship to your desired track becomes greatly simplified.)

Cost-Per-Mile

(Continued from page 29)

if we hide this painful cost-per-mile? Is he entitled to this information? Does he need it? If so, he ought to have figures with a meaning. Since the figures can be controlled by altering the suggested management policy, he has no usable answer. Every manufacturer and operator sets up a different policy. If he wants to compare the answer with public transportation fares, he has no equality of distance because methods of measuring distances are different for various forms of transportation. Besides this, airline fare is a net expense; aircraft ownership involves tax savings. Even if the buyer successfully unraveled all this, he might still make a serious mistake.

The two forms of transportation are as far apart as the commercial bus and the private automobile. Air transportation is not a similar "ready made" product. Why infer that it *is* by proffering this type of expense data? Your actions (if you do) speak louder than your words of protest. This man may really need an airplane. Your obligation to him does not consist of furnishing inaccurate data to be used for an impossible comparison.

A cost-per-mile figure may look like less money than $80,000 per year. Any simple division will accomplish this without changing the basic facts. The difficulty here is that your prospect may be able to multiply faster than you can divide. Why assume that he is afraid of large numbers? Doesn't he work with them every day?

This businessman runs his company in terms of dollars per year—profit, taxes, everything. His bank balance is in instantaneous dollars. If he wants to know if he can afford it, he will weigh the total dollar expense, not dollars per mile. He will get this total before he decides what to do.

If you gave him cost-per-mile, he now has both. Why stress that a multi-engine aircraft is expensive to operate "anyway you look at it"? He knows what to do with dollars per year, and he has a vague idea that the figure you gave him is supposed to be compared with something. Do you really want this comparison made?

Quietly give the man the data he needs, and concentrate on showing him that the aircraft is worth it.

Aircraft owners, as well as sales people, should abandon this cost analysis system. If the system is an accepted operational practice, the non-owner businessman will expect and ask for the figures. Sales assistance will ultimately lower the cost of aviation for everyone.

Pilots are also selling aviation to their own companies, And although those companies may swallow an unfavorable economic comparison for the moment, a reversal in business trends may be enough to make some of them take a second look. Cost-per-mile may turn out to be the grave of Business Aviation—dug with a calculating machine.

ACC Reports to President

In its 1956 Annual Report, the Air Coordinating Committee advised the President that it had recommended VORTAC primarily because of extensive military requirements for high performance aircraft operations and the planned introduction of civil jet transport flights in the U.S. in 1959, both of which require a compatible distance measuring system in the interest of national defense and a common system of operation.

ACC also reported that it had endorsed the CAA's request to Congress for increased funds to modernize the nation's air traffic control facilities. The Committee told of progress of the Airspace Panel in settling conflicts among the various airspace users. It mentioned the agreement aimed at preventing future conflicts between radio-TV broadcast and aviation interests on the problem of tall antenna towers occupying navigation airspace.

ACC also announced agreement on a National Search and Rescue Plan which named the agencies to take charge of land, sea and air operations when floods, hurricanes, air crashes or other disasters strike U.S. or territories.

Its Economic and Resources Div. will study the problem of charges to operators for the use of airports. The Committee reported continuing progress in the simplification of governmental border-crossing procedures to facilitate travel.

Through its Airport Use Panel, the Committee disclosed that it had resolved 40 cases involving controversies between civil aviation interests and military agencies over the use of public and military airports. The Committee added that its airport group is finding that joint civil-military use of airports is becoming increasingly difficult, and urged a speed-up of the nation's airport development programs.

500th Cessna 310 Will Be Uruguayan Ranch Wagon

International progress of business aviation, as well as international success of American aircraft, was typified in the recent sale of the 500th Model 310 Cessna business plane to a rancher and wheat farmer in Montevideo, Uruguay.

Sale of 310 #500 is a milestone for Cessna. The light twin has been in production since late 1954, and is now in service all over the world. That the plane should be sold in the export market is a big plus for the whole theory of aviation for business.

Receiving the 500th 310 was Gustavos Mailhos. His family has extensive wheat and cattle interests in Uruguay, and the plane will be used for both business and pleasure. Prior to his purchase of the 310, Mailhos had logged 200 hrs. in a single-engine Cessna 170. The plane was picked up from Cessna's Wichita plant, and the trip home will include vacation stops in Mexico, Panama, Ecuador and Chile.

TAKE A HEADING FOR *Reading*

Plan to Attend the

EIGHTH ANNUAL MAINTENANCE AND OPERATIONS MEETING

Saturday, June 1, 1957

AT READING MUNICIPAL AIRPORT. READING, PA.

Featuring An Outstanding Program

DISPLAYS • DEMONSTRATIONS • DISCUSSIONS

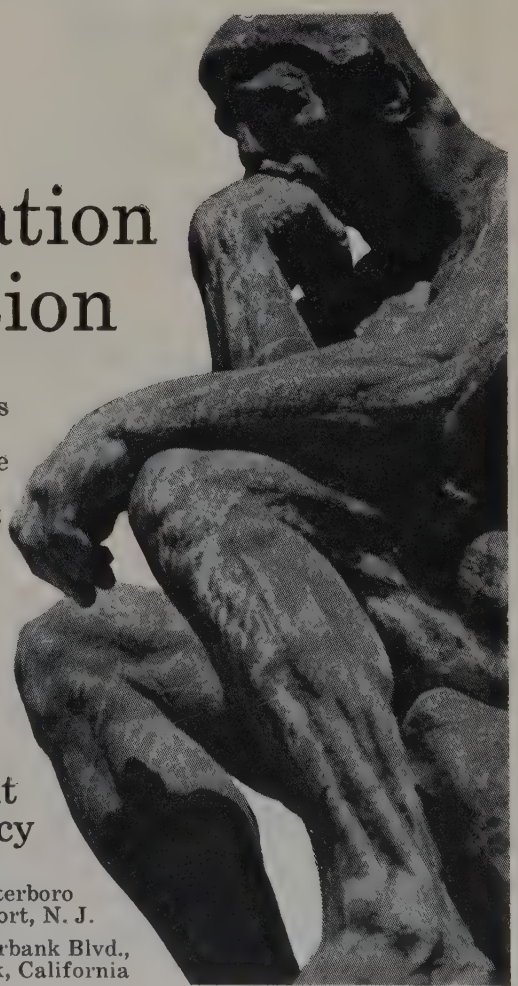
THE READING AVIATION AWARDS

It's the Nation's #1 Civil Aviation Show

DON'T MISS IT

READING AVIATION SERVICE, INC.
Municipal Airport • Reading, Pa.
Reading 3-5255

concentration on aviation



Originally created to fill your need for experienced pilots exclusively, now prepared to also serve as your "prime source" for ground and administrative specialists . . . supplying top-notch personnel, pre-screened to save your time . . . this is the contribution P.E.A. is proud to make to the aviation industry.

RELIABLE SERVICE FOR OVER A DECADE

pilots employment agency

PEA

Teterboro Airport, N. J.

3315 Burbank Blvd., Burbank, California

BAYAIRE AVIONICS
INCORPORATED

Service • Sales • Installation

• COMMUNICATIONS
• NAVIGATION
• CONTROL
• RADAR

CAA Repair Sta. 3863

Distributor for

ARC
Bendix
COLLINS
DARE, INC.
FLITE-TRONICS inc.

Service dealer for
LEAR • MITCHELL • NARCO

BAYAIRE AVIONICS
INCORPORATED

HANGAR No. 2
OAKLAND AIRPORT, OAKLAND, CAL.
LOckhaven 9-8385

. . . . in the business hangar

■ Qualitron, Inc., Burbank, has completed installation of a complete communication and navigation radio system, including Bendix radar, Sperry A-12 autopilot and engine analyzer on Westinghouse Electric's Lodestar, Curly Korb, Chief Pilot. ☐ Sears DC-3, based at Burbank, is now using ARC Type 21 ADF system installed by Qualitron. ☐ Completed modification of Sharon Steel Lodestar radio system; has Bendix MN-60 loops, RA-18, MN-85 and RMI. ☐ Dual ARC 21 ADF, Flitetronics CA-3 speaker amplifier, and Collins 37X-1 marker antenna installed on Richfield Oil's second Twin Beech. ☐ Complete radio installation in the David Myers Marketing Co. Bonanza includes edgelighted panel, ARC Type 15D, T-20 VHF transmitter, Type 21 ADF and R-89B glide slope receiver. ☐ Al Junker, Bethlehem Steel Chief Pilot, is having Qualitron install Bendix radar in one of the co. Lodestars. ☐ Sunray Oil Chief Pilot Herman Arnspiger brought in the co. Lodestar for installation of Collins dual 17L-6/51X VHF communications, Collins Dual 51R-3/51V VHF navigation, Bendix MKA-7A marker, Sperry C4-A gyrosyn compass and edgelighted control panel. ☐ Lodestars belonging to Mellon Nat'l. Bank and Forrest Oil have had radio modification and service completed by Qualitron.

■ Sentas Skyways Service, Detroit, reports the following modifications on their Super SeaBee to improve take-off and altitude performance: supercharger on engines for extra power on demand; 2-blade prop replaced with 3-blade; improvements in cooling system, oil radiator, carburetion. Improved model has flown 236 hrs.

■ Franklin Aviation Enterprises, Miami, reports further modification of their "Gander" conversion of Super Goose Amphibian. Landing speed reduced 5 mph by slotted flaps operating electrically which permit any degree of deflection. Incidence in stabilizer increased with bungee control system on elevators. Vertical fin will be dorsal type. Entire fuel system will be changed to use electric boost pumps for auxiliary supply. Also incorporates flush engine cowls with straight augmented exhaust system. These later additions coupled with previous modifications: square wingtips, curved plexiglas windshield, 10-place conversion of interior, electric landing gear, Goodyear spot brakes, new ventilation system. Cruise estimated at 160 mph, landing speed 60 mph at 8900 gross.

■ Howard Aero, San Antonio, reports delivery of two new Super Venturas. ☐ Most completely equipped Super Ventura to C. E. Morris, Mgr., Aircrafts Ops., Socony Mobil Oil Co., has RCA radar, Sperry autopilot and complete Collins communications and navigation equipment. ☐ Second recent Super-V delivery to National Distillers Prods., N.Y.C.; plane equipped with Bendix radar, Bendix communications and navigation equipment, Sperry A-12 autopilot and JATO. ☐ Two key members of Page Airways, Rochester fixed base operation, have completed a 10-day familiarization course with the Super-V at Howard's Mfg. Div.

■ Pacific Airmotive Corp.'s Burbank Aircraft Div. has delivered Sharon Steel's Lodestar after installation of PV-1 type landing gear and flap selector system, auxiliary electric hydraulic pump, one-piece windshield, PAC's proprietary flush dump chute, PAC nose pitot, dual fuel system. Aircraft Tank Service stripped and resealed all fuel tanks, and Aero Interiors installed a new custom interior. Pilots are T. A. Jones and A. M. Wilkins. Maintenance Chief: W. D. Gibbs. ☐ Roy Weiland, Mellon Bank's Chief Pilot and NBAA rep., received the co. Lodestar with newly installed PAC short stacks, 50,000 BTU heater in each nacelle, 100-hr. inspection and relicense. Complete tank reseal by Aircraft Tank Service. ☐ Lockheed 221B, one of several operated by Bechtel Corp., had overhaul of main landing gear and tank seal at PAC. Pilot is Vic Voit. NBAA Rep. is Chief Pilot A. K. Roden. ☐ Vinnell Co.'s Twin Beech, piloted by Chas. Eaton, is back in service after engine change, control surface recovering. ☐ Delivered Aerojet-General's DC-3 242AG after complete buildup and modification. Every component, system and all equipment has zero time. Fuselage, empennage, tail section and wings all obtained from different sources and reworked to latest specifications. Qualitron installed dual radio and communications system; Aero Interiors installed 18-pass. deluxe interior. Various modernization items by PAC: installation of airstair door, large cabin windows, rear baggage compartment, Transair's fibreglas landing gear doors, Aerojet Jato, Connie type pilot seats, 1-piece windshield, search and seek nose taxi light. Aerojet pilot is Frank Dolinski. ☐ Chief Pilot Al Junker, Pilot "Ike" Eisenhauer and Co-Pilot Bob Jeffrey have Bethlehem Steel's Lodestar 4851V back at Penna. after work by PAC which included: PAC short stack installation, 50,000 BTU heater in each nacelle, electrically heated windshield and carburetor air scoops, PAC flush dump chute, Edison fire detector system, Cleveland Aero Prod. tail strut, plus repainting, 100-hr. inspection, relicense. Aircraft Tank Service stripped, resealed all fuel tanks.

■ Southern Ohio Aviation Co., Vandalia, O., has completed conversion from 560A to 680 on Aeroquip Corp's Aero Commander. Also installed: Goodrich de-icing system and Aeroquip lightweight 601 Oil and Fuel Hose with 624-type fire-proofing sleeve on all lines forward of the firewall.

■ Airwork Corp's Atlanta branch has been appointed distributor for products of Bendix Corp.'s Redbank Div., including generators, voltage regulators, faults detectors and inverters. Airwork offers both sales and service on Bendix products.

■ Roscoe Turner Aeronautical Corp., Indianapolis, installed R89 Glide Slope Receiver, and ARC CD-1 Course Director System in Mouldings' Aero Commander. ☐ National Homes' Super 18, J. E. Hartney Chief Pilot, is in the air after 100-hr inspection and minor repairs at RTAC. ☐ Bill Tabor flew the Wilcox Super 18 to RTAC, bringing Bob Lee for consultaton on Wilcox installations performed by Turner.

■ Executive Aircraft Service, Dallas, completed periodic inspections and misc. re-

pairs for LeCuno Oil Co. Lodestar, Gene Morscheck and Harold Gooden, Pilots; Union Chem. & Materials' DC-3, Charlie Bolton, Pilot; and Atlantic Refining's DC-3, Herb Hansen, Pilot. ☐ Pilot N. L. Ledbetter and co-pilot Jim Wheeler brought Seaboard Oil's DC-3 for periodic inspection and installation of Super-92 engines and "Maximizer" exhaust system. Also, a new interior with 3 panoramic windows and enlargement of all other cabin windows to 17" x 17"; installation of Scott's oxygen system, Kidde freon fire extinguisher system, complete new electrical system including 200 amp generator, switch panels, circuit breaker panel and "J" boxes, Janitrol heater with Barber-Coleman automatic heat controls, and exterior repainting. ☐ Beryl Minard, Pilot and Harry Hosmer, Co-Pilot for Gulf Interstate Gas, Houston, brought the co. Lodestar for periodic, misc. repairs, and new installations including: engine change; complete electrical wiring with 200 amp generator system; fire extinguisher system; Edison fire detector system; radio, complete with racks and switch panels; Bendix X-band radar; dual fuel system and refinished cabin furnishings with a new commissary.

■ Grand Central Aircraft, Glendale, has completed replacement of R1820-87 engines with R1820-56A's in Jacqueline Cochran's Lodestar, piloted by Capt. Tom Davis and J. Bennett. ☐ Repairs, modifications, complete tank reseal and misc. work on a Pacific Northern Airlines DC-4, the 2nd PNA DC-4 at Grand Central this month. ☐ Husky Oil Co. B-25 at G-C. Jack Duggleby Chief Pilot. ☐ Chief Pilot Matt Springer ferried Peter Kiewit Son's DC-3 to G-C for new paint job, recovering of surfaces, other misc. work. Plane is based at Omaha.

■ Southwest Airmotive, Dallas, completed 100-hr. inspection and misc. work on Waterman Steamship's Learstar. Pilots are Jim Koontz and Geo. Holland. ☐ Richard Muller brought Page Airways' new E18S Beech to SAC for compliance with new crankshaft bulletin. ☐ Another Beech in for same service from Elliott Flying Service, Davenport, Ia. ☐ Anderson Pritchard's D18S Beech to SAC for single engine change; flown in by E. E. Scott and Bill Dressell. ☐ Jimmy Boyd and Bill Ireland brought Shamrock Oil and Gas Lodestar in for 100-hr. inspection and misc. work. ☐ Major work and engine change on International Paper Co. Lodestar, Carl Lund and George Holland Pilots. ☐ Chief Pilot Bill Correll and Pilot Jim Koontz brought Waterman Steamship Lines' Lodestar to SAC for major work. ☐ Allan Wiggins and Mat McKenzie brought Southern Minerals' D18S for 1000-hr. inspection. ☐ Bill Pruner and Philip Kaufeld brought Cummins Engine Co.'s DC-3 in for inspection and radio work. ☐ Inspection completed on Michigan Tool Lodestar, Paul Holtz, Pilot. ☐ Anderson Pritchard Oil's D18S Beech brought in by E. E. Scott and Bill Dressell for engine change.

■ Norman Larson Co. Plane Service, Van Nuys, has completed installation of 2 new Lycoming engines and airframe inspection on Nevada Natural Gas Pipe Line Co. Twin Bonanza. Fred H. Alexander, exec. pilot, flew it in from Las Vegas. ☐ Ralph Thomas, Chief Pilot for Mario Hernandez, Mexico exec., had Scott oxygen system, Narco Sapphire radio and new Lycoming right engine on the Twin Bonanza. ☐ Dr. Paul S. Lang, Culver City, flew in for 100-hr. relicensing on his Bonanza. ☐ New interior installation for the Techniflax Corp. Bonanza, based at Holyoke, Mass. Flown in by Joe W. Coffman. ☐ Larson installed Glide Slope and power supply for Fla Bob., Inc., Riverside; Pilot is Flavio Madariaga.

■ Aircraft Radio & Accessory Co., Denver, completed first installations of weather radar in executive B-26 aircraft. Bendix RDR-1B was first installed in the Colorado Interstate Gas Co. plane, Jim Ruble, Pilot. Second installation made in Colorado Oil & Gas plane. ☐ Installation completed of dual ARC ADF-21, ARC 15D omni, Bendix MKA-7A Marker, Collins 51R-3, Narco 1016, Collins 51V-2, Glide Slope, Flite-Tronics DS-5A amplifier, new instrument panel and custom edge lighted radio panel in Vanadium Corp. of America's 680 Aero Commander. ☐ 680 Aero Commanders operated by Climax Molybdenum and Western Auto Transport have dual ARC ADF-21 and 15D omni, ARC CD-1 course director, Bendix MKA-7A marker, Collins 51V-2 glide slope, Dare DTR-360 VHF transceiver, ARC F-13A amplifier, Lear L-2 autopilot with approach coupler and altitude control, ARC T-21 transmitter, new instrument panel and edge lighted

■ Northern Aircraft Co., Oakland, has received the Aero Commander franchise for N. Cal., Nev., Ore.

Flying to NEW YORK?

NEWARK AIRPORT

has long been recognized as one of the finest fields in the country from the pilots' viewpoint.

There are good reasons for this:

Newark Airport, with new highway approaches to Manhattan, is more accessible than any other airport in the metropolitan area.

NEWARK AIR SERVICE, INC., under new management — in big new quarters, is prepared to give you the *service, dependability and comfort* you deserve . . .

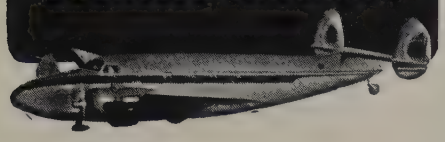
Try us and see! Or write and inquire to David L. Steege, Vice President and General Manager.

HANGAR No. 12

NEWARK AIR SERVICE, INC.

NEWARK AIRPORT, NEWARK, NEW JERSEY MARKET 2-5128

AUTOMATIC CABIN TEMPERATURE CONTROLS FOR BUSINESS AIRCRAFT



- Available for either cycling combustion heaters or proportioning exhaust and ram air.
- Maintain constant selected cabin temperature.
- Easily installed. No shielded wiring, vacuum tubes, or mercury thermometer.
- Widely used on DC-3's, Lodestars, Mallards, A-26's, PV's, B-23's, Aero Commanders, and other executive planes.

WRITE FOR LITERATURE

BARBER COLMAN Aircraft Controls

BARBER-COLMAN COMPANY
Dept Q, 1429 Rock Street, Rockford, Illinois

For Immediate Sale
ROYAL GULL AMPHIBIAN
This Aircraft has been operated exclusively for one company — 270 Hrs. total time since manufactured 1956.
TAL TIMMINS AVIATION LIMITED
Montreal Airport, Montreal

For Immediate Sale
LOCKHEED LODESTAR
Presently in executive use — 1820-56 Engines; 240 Hrs. S.O.H. 4000 Hrs. Total Time.
TAL TIMMINS AVIATION LIMITED
Montreal Airport, Montreal

For Sale—New
Airborne collapsible motorcycle.
Type used during WW II by paratroopers.
Skyways Box 726

■ American Airmotive Corp., Miami, recently completed 8000-hr overhaul, complete rewiring, new galley and radio rack installation, Sunair radio, 200,000 BTU Janitrol heater, complete new exec. interior and exterior repainting on Great Lakes Carbon Corp. DC-3. Reduction in empty wt. of Bridgeport-based plane achieved with new interior. Chief Pilot Wm. Horan, Co-Pilot Joseph Grenier and Maint. Rep. John Bednarz supervised work. □ 1000-hr overhaul, interior rejuvenation of International Petroleum of Colombia C-47, based at Bogotá. Company rep. Richard Carleton supervised. □ McLouth Steel's Grumman Mallard, Pilots Wendell L. Wait and Walter G. Olson at A-A for new deluxe interior plus exterior repainting and 1000-hr airframe & engine service. Plane based at Detroit.

■ Garrett Corp.'s AiResearch Aviation Serv. Div., Los Angeles is installing TV sets in Convair 440s owned by John Mecom, Houston, and Ford Motor Co. Mecom's plane also having hi-fi tape recording system and FM transciever for communication with Texas Oil headquarters. □ Pilots George Oswald and Steve Sandmayer brought in Morrison-Knudson DC-3 to have wings removed for corrosion inspection, aileron recovering, red-and-white cowl instrument lighting, and edgelite installation on radio switch panel. □ Recovering of control surfaces and modification of landing gear on Texas Co.'s D-18S Beechcraft, accompanied by Aubrey Keif, mgr. of aviation sales.

■ Spartan Av. Serv. Div., Tulsa, completed installation of RCA AVQ-10 weather radar and new interior in Swiftflite Lodestar. □ Mechanical Prods. Co., Jackson, Mich., took delivery of their new Ventura from Spartan, who installed Pioneer PB-10 autopilot plus latest Collins navigation-communication equipment. First plane to be equipped with new Spartan Jet Exhaust System, reported to add 20 mph to Ventura top speed.

■ Van's Air Service, Winona, Minn., completed 100-hr inspection on Lodestar belonging to NBAA member Giddings-Lewis Mach. Tool Co., Doug Lionberger, Chief Pilot; 100-hr ins. and engine change on Ray-O-Vac Aero Commander, Bill Allen, Chief Pilot; 100-hr on J. R. Watkins' 310, Pilot Jack Ollum. □ Two engines were majored, annual inspection, 3-bladed props and radio maintenance were completed on Gramm-Trailor Co.'s Aero Commander. □ 100-hr inspection completed on Navions owned by Dr. Lloyd Whitesell, DeKalb Agricultural Assn. 100-hrs completed on Bonanzas of E. J. Armit Const. Co.

■ Oakland Airmotive Co., Oakland, has completed bat wing horizontal stabilizer modifications on Hancock Oil's Lodestar, piloted by Bob Ceniceros. □ Bill Cloes and Herb Thomas of Consolidated Western Steel brought their Lodestar in for complete re-wire, interior, new de-icer boots, and the OAC Speed Modifications (bat wing removal, change stabilizer angle of incidence, nose-mounted pitot tubes, nose taxi lights, fiberglas fuselage saddle). □ Bechtel Corp. Lodestar, piloted by Elton Stone and Geo. Hagerman, also in for OAC Speed Modifications, plus new headliner and converted air ducts, new instrument panel, refitting of cockpit, complete airframe and engine re-wire, dual fuel system, repainting and relicense. □ DC-6 recently delivered by PAA to JAL was in for landing gear and brake modification, instrument system modification, and new galley. □ Aviox Oxygen System installed in U.S. Plywood's Aero Commander, Chuck Holcomb, Pilot. □ Oakland Airmotive's new operation, Bay Aviation Services, is in full swing; complete fueling and maint. facilities operation. □ Bay Av. is reassembling 8 Twin Beechcraft from Tokyo. □ 100-hr inspection completed on Specialty Union's Lodestar, Ron Backues and Bill Armour Pilots. □ Kern County Land Co.'s DC-3 piloted by Jim Gray and Harvey Rand, in for 50-hr. inspection and cylinder change.

■ Hawthorne Flying Service, Charleston S.C. completing 1000-hr. check, bulletin compliances, complete overhaul of all radio equipment and installation of new ARC ADF-21 in Amerotron Corp.'s Aberdeen Aero Commander, B. W. Sumner, Pilot. □ Wrenn Bros.' Pilot, Jack Shelton, brought their Twin Bonanza to Hawthorne for 500-hr. check and radio servicing, installation of new antenna systems, and relocation of instruments and radio controls. □ West Va. Pulp & Paper has leased a new Piper Apache from Hawthorne. Prior they had a 3-yr. lease on a Bonanza, flying an average of 1000 hrs. a year exclusively for business.

■ Remmert-Werner, St. Louis, installing Bendix X-band radar and Sperry H-5 electric gyro-horizon in Mpls-Honeywell DC-3. Ridgeway Baker is in charge of their Flight Dept. □ Walter Schwarzhoff, Chief Pilot Detroit Gasket Co. D18S, brought the plane to R-W Toledo for double engine change. □ Mel Christler and Morris Avery of Greybull, Wyo., brought their B-18 to R-W for double engine change, paint job, annual relicense. □ James Leonard and Ralph Rathgeber brought the Allen Scaife DC-3 in for installation of R-W lightweight landing gear doors. □ Bob Rennecker, Pilot for Nationwide Insurance, Columbus, O., brought one of their DC-3's in for change of one Super-92 engine. □ Heckett Engrg. Super-92 DC-3 in for double engine change. John Gildea is Pilot. □ R-W StL reports an increase of 10 mph on their Super-92 DC-3 demonstrator with their new lightweight DC-3/C47 landing gear doors. Flush closing reduces drag, reduced open drag adds safety to single-engine operation. Fuel consumption reported reduced 3-5 gph. Doors can be installed during 100-hr. inspection, require no change in hydraulic system, oil system, present landing gear. □ Remmert-Werner, StL, has delivered the 3rd custom D-18 to Sinclair. □ Don Heussler, Buffalo, has a new R-W execs DC-3 with Bendix radar, Collins autopilot and IFS, and new R-W lightweight landing-gear doors. Jack Prior is Pilot. □ Engine Works, StL, authorized by P&W to perform AD 56-26-3 on R985 crankshafts. □ Hollinger-Ungava Transport, Canada, has installed Super-92 engines on its whole fleet of DC-3's. □ Walter Westerfield had an ARC-21 ADF installed in Gen. Insurors Aero Commander. □ New Super-92 DC-3 to Holiston Mills from R-W Pompano equipped with retractable tail wheel, lightweight landing-gear doors, flush loops, Collins exec. radio, special lounge type interior. Pilot is John Briggs. □ J. B. Michaels Const. Co. D-18S, Wm. Johnson Pilot, was at R-W StL for installation o

de-icer boots and plumbing, and 1000-hr. inspection. ☐ Austin Goodwin brought Houston Lumber's -92 DC-3 to R-W StL for double engine change. ☐ Wayne Dunham & Bud Henning brought Nationwide Ins. Co.'s DC-3, Bob Rennecker Chief Pilot, for installation of Super-92 engines. ☐ New exec. DC-3 to Gen. Mills., Mpls. Converted at Pompano, has RCA radar, Sperry A-12 autopilot, Collins 17L-3 transmitter and 51V glide slope, custom SAE instrument & radio panels, custom interior.

■ Dallas Aero Service completed installation of dual hydraulic system, flow meters, outside painting and modifications on Champlin Rfg. Co. 680 Aero Commander, Pilot Bill Toler. ☐ Pilot Frank Lightfoot flew the Anchor Metals' Aero Commander for complete radio installation, paint job, fuel flow installation, dual hydraulic installation and other work. ☐ Sun Oil's DeHavilland Dove at DAS for new interior, radio installation, new instrument panel. Pilot is Joe Irwin. ☐ Textiles, Inc., DeHavilland Dove flown in by Pilot Ernest Webb for new interior and cabin redesign, 100-hr. inspection and radio installation. ☐ Russell Firestone Lodestar at DAS for new interior and modernization, exterior painting, dual fuel system, 100-hr. inspection, stabilizer incidence increased. Janitrol heater installation, short exhaust stack system and addition of Convair wheels and brakes. Pilot is Bill Powell. ☐ The Jim Cook F-51 Weather Recon plane at DAS for engine change, recording instrumentation and new radio. ☐ J. Ray McDermott Lodestar was flown in by Pilot Bill Dugan for saddleback fairing installation, radio installation and Dallas Aero Speed Improvement. ☐ Engine change completed on Youngstown Sheet & Tube Lodestar; Pilot is Bart McCutcheon. ☐ Wagner Sign Co. Twin Beech at DAS for double engine change and 100-hr. inspection. ☐ Pilot Harold Serpas flew in Sun Oil's Widgeon for engine change, 100-hr. inspection and new radio installation. ☐ Olin Mathieson Twin Beech in for engine change. Jack Tarver is Pilot. ☐ Double engine change on Bert Fields' Twin Beech; flown in by Pilot Ken Koelling.

Jump Seat

(Continued from page 35)

Teterboro

Frank LaVigna, Arthur Godfrey's Pilot, would have sold DC-3 NIM "real cheap" in Gander recently. After months of careful preparation for the much publicized trip to Africa, Frank got to Newfoundland, developed a rough engine and between weather and poor facilities was two weeks getting started again. By this time, Godfrey, General LeMay and party were gone, so Frank turned around and came home. Frank's comments would never pass the eagle eye of Lois Henry, so they have been omitted.

Chicago

Meigs Field, having been enlarged to approximately the general dimensions of a medium sized aircraft carrier, we popped the PV aboard and talked with our old friend, Joan Maloney, who is Butler Aviation's mainbrace at Meigs. The Ambassador sent

(Continued on page 51)

COMCO

TWO-WAY RADIO

communications equipment

VHF-FM FOR: MOBILE, AIRCRAFT, MARINE, MOTORCYCLE, PORTABLE, BASE

VHF-AM FOR: AIRPORT VEHICLES, GROUND STATIONS, POINT-TO-POINT

VHF: ANTENNAS, REMOTE CONTROLS, ACCESSORIES

FLIGHTCOM

MODEL 400-12/24 SERIES

VHF-FM for AIRCRAFT

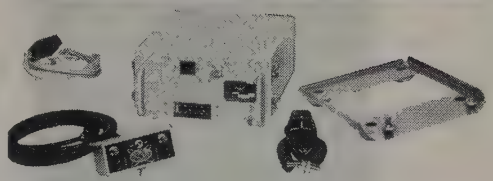
Provides communications between ground FM systems and executive, patroling and utility aircraft. Used by fishing fleets, petroleum producers, pipe line helicopters, State police, Conservation departments, crop dusters, power companies and departments of the U. S. government.

All FLIGHTCOM models are on FCC "List of equipment acceptable for licensing" and are certified with the Federal Civil Defense Administration.

Model 400-12/24 Chassis

FEATURES:

FLIGHTCOM PACKAGE



Model 400-12/24

COMPACT, Case size 14"x11½" x6½".

LIGHT, 22 lbs. (without antenna and speaker).

POWERFUL, 25 watts output.

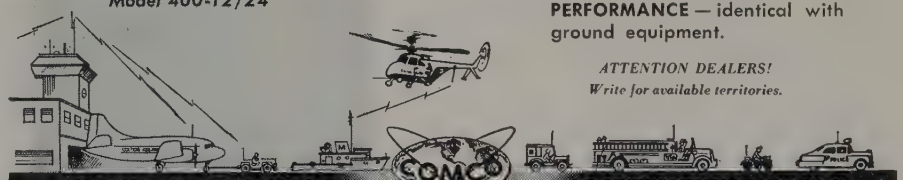
UNIVERSAL, instantly changed from 12 to 24 volt.

EFFICIENT, low battery drain.

LOUD, 1 watt minimum.

PERFORMANCE — identical with ground equipment.

ATTENTION DEALERS!
Write for available territories.



DESIGNERS AND MANUFACTURERS OF RADIO COMMUNICATIONS EQUIPMENT

COMMUNICATIONS COMPANY, Inc.

FOUNDED 1938 CORAL GABLES MIAMI 34, FLORIDA

For Sale—LOCKHEED LODESTAR

Clean, well equipped; fully converted; deluxe interior.
In use by Midwest manufacturer. Available immediately.
Address inquiries to SKYWAYS Box 725

THE PERFECT OVERNIGHT AND LUNCHEON STOP

STEWART AIR PARK

HOWARD JOHNSON'S RESTAURANT
SKY MOTEL ACCOMMODATIONS
COMPLETE SERVICE FACILITIES
PARKERSBURG, WEST VIRGINIA
B. D. "Bun" DeWeese, Manager

Pratt & Whitney Panel

(Continued from page 16)

2,000 and 2200 rpm. You do two things there: you don't check just the magnetos; you are also checking the power put out by the engine as evidenced by the props being against their low pitch stop and giving you a certain rpm with a certain manifold pressure from the engine."

Member of the Audience: "At field barometric pressure, one engine develops 2200 rpm and the other 2100. Is the one that develops 2200 capable of more power?"

Cake: "If your propellers are exactly the same, it is."

Member of the Audience: "Sometimes we can get as much as 100 rpm variation just as the wind blows."

Cake: "That will occur because of the airflow around the cabin of the plane and its effect on the propeller on the opposite side. The *only* guide you can use there is experience."

Member of the Audience: "On the R-1830, -75 and -94 engines, has anything been developed in carburetor settings, by any of the overhaul agencies, that would make the carburetor slightly richer than it is on the flow bench? Or am I out of line in using richer settings?"

Cake: "We don't really know about what settings have been made. Some of the overhaul agency people would know that; but you will not do any harm whatsoever—indeed, you might do good just by enriching a little. Some of these settings were made very lean; some of them were made too lean, as a matter of fact, but for special reasons. If you have one that is too lean—I don't know about the -75 specifically—then you should richen it."

Frazee: "Why do you find it necessary to run a little bit richer? Is it because you get into a little roughness?"

Member of the Audience: "We go richer because we do notice a little roughness. We wait about 5 min to lean out after cruising and about the next 30 min., even although it is a little rough, we have noticed by enriching that you can pick up 5 to 8 knots. We have fuel flow indicators and we would notice a fluctuation in the fuel flow gauges until we did richen up."

Frazee: "The instability that you see there is probably the result of the fact that the -75 engine in the DC-3 tends to overcool. The -75 cylinder, compared to a -95 cylinder, has many more fins. Two things can be done. First, when your cowl flaps are in the closed position, make sure they close completely. Secondly, at an overhaul, make certain that the clearances from valve stem to guide are reamed toward the high limits. Valve action slows down when the engine is too cool.

"The R-2000 in the DC-4, for example, had the same problem in the early days of its operation because the hydraulic cowl flap system would tend to creep open. The carburetor setting for the -75 was originally developed in the B-24. Perhaps a little richer in the DC-3 would be to your advantage."

Member of the Audience: "Do you know of any overhaul agency that has worked on the richer settings?"

Frazee: "I don't. Perhaps Mr. Gillespie could tell you. Where do you normally set the carburetors?"

Gillespie: "There has been a trend ever since the -75 was originally installed in the DC-3 towards richer settings. There have been, I believe, 2 or 3 changes in the parts list number to richen up the carburetor.

"An indication that we have gone in the right direction, is the result that the engines have been running hotter since enriching the carburetor than they did before."

Frazee: "Cylinder head temperatures on the -75 below 180 are very apt to make the engine roughen up."

Kesseck: "We are just in the process of spending $400,000 for an airplane equipped with an engine that was built 15 yrs. ago. We don't have much other choice. I would like to hear some of P & W's thinking on the spare parts situation for these obsolete engines we will have to work with. How long are you going to keep making 1830's or 2800's, and how long are customers going to keep operating them?"

Frazee: "Pratt & Whitney is well aware of the problems of parts supply on older engines, and we are doing everything we can to make certain that, if you give us reasonable lead time on parts orders, you will be taken care of.

"We have a subsidiary company in P&W in Montreal, which is now building 985 and 1340 parts as well as new 1340 engines. They are also producing at the present time a large percentage of all R2000 parts. P&W is still making 1830-92 parts and will continue to do so as long as there is a reasonable demand.

"At the present time, from the information that we have, the surplus spares picture is getting very dark because all the parts have either been used or have rusted out, so that we are rapidly becoming the only source of supply for good P&W parts. Consequently, we are set up to make parts on all commercial model engines. This does not necessarily apply to those engines which were built *only as military engines*. For example, there are certain parts on the -75 and -94 which we are not making.

"Many of the parts which are used in the -75 or -94 are also built for other model engines, but there are some parts which are peculiar to those particular engines. On the single rows, our present policy is that you will be taken care of, but if you anticipate a parts need, don't expect to get them off the shelf immediately.

"It has always been the policy of the company in the past, when they do go out of parts, to circularize everybody in the world who we know is using these parts. The 985 is good for another 15 yrs., and so is the -92, which is the same as our commercial SIC3G. The parts are in current production for that engine."

Pague: "Some of our members are operating the 985 series, and I'm sure they would like to hear a discussion on that engine. George Dickerson, have you found any particular problems with the 985—any major components that are failing, for example?"

Dickerson: "The 985 engine is relatively trouble-free. We had two piston pin failures last year. Aside from that, we have had routine overhaul problems which can be corrected by the use of new parts and rework of some of the old ones."

Member of the Audience: "Do you have any comments on the airline training speed kit?"

Cake: "That is principally an airplane set of parts; the only thing that involves the engine is a slight change in the exhaust system and in baffling. We have had nothing to do with it; I don't know what the results were."

Member of the Audience: "I believe that during the past year or two there have been a number of cam gear failures—not necessarily the gear itself but the rivets on the cam reduction gear. I know of 4 or 5 cases where the rivets have been sheared. Would that stem from rivet replacement?

"We have gone to the heavier cam reduction gear and in one instance heavy cam reduction failed. Is this a critical trouble in 985's?"

Frazee: "We have seen a set of parts which came in from North West Aeronautical in which there was a cam gear failure. Most of the rivets had sheared. Our laboratory looked at the parts, which had apparently failed in fatigue, possibly due to the fact that the rivets, during the years, may have developed some looseness and the constant working back and forth had fatigued the rivets.

"We have issued a letter to all of our service men suggesting that a very careful inspection of these rivets be made at overhaul.

"We have also O.K.'d doubling the number of rivets installed. However, this has not been a chronic problem.

"On the 985 we would also like to suggest that any piston pins on which the part time is unknown be replaced. Then replace piston pins *at every second overhaul* after that."

Member of the Audience: "We have established the policy of inspecting the rivets on the cam reduction gear at 100 hrs. We are able to inspect the gear by removing the plugs on the nose case. We can get in there and press the rivet and see if a small amount of oil comes out. In most cases we can find the trouble before it becomes major. A number of 985 operators have established the same policy."

Frazee: "I certainly like your idea of inspection. We will put out the information via our field service men on how this check could be made."

Pague: "Are there any questions regarding the overhaul period on 985's? There is quite a variation in hours, as to when the engine is overhauled."

Member of the Audience: "Could you tell us how much one minute of take-off power equals in minutes of cruise power, as far as wear of the engine is concerned?

"We operate an R2800 Ventura, an average trip of 1½ hrs., so in 900 hrs. we have only made 600 take-offs. As opposed to that, we have a seaplane in which our average trip is 6 min. Five hundred hrs. operation for that particular engine includes 6,000 take-offs.

"I sometimes wonder if we make a mistake in judging our engines by total hours rather perhaps than by number of take-offs."

Frazee: "Wear is not a good criterion to use in this particular case. Wear on the internal engine parts is primarily a function of rpm, the amount of dirt that goes through it, etc.

"However, in your particular comparison it is more a problem of fatigue of the parts. Obviously any engine which you subject to higher stresses during the same period of time, will be less dependable than an engine which you subject to a lower level of stresses.

"If you look at the scheduled overhaul times, the airline's run on their various equipment, you would find the answer there. For example, United Air-Lines DC-6B's operate their engines up to 1600, 1700 and 1800 hrs. between overhauls. The same engine is installed in a CV-340 whose normal operation or flight is much shorter. They pull those engines at 1100 hrs. and parts replacement at overhaul is higher than on an engine which has been in DC-6B service, because of the greater percentage of time spent at high power. The higher the power the higher the temperatures and pressure. Your valves, cylinder heads and piston pins take more of a beating, all of the parts which are in greater stress. Certainly it is wise to schedule more frequent overhauls on an engine that is going to take that type of beating.

"However, we have always adhered to the policy that the engine will tell you the story. If you are operating a 1340 and it is the first time around, take a look at it at 600 or 700 hrs. Then inspect the engine very carefully at overhaul, not only by your engine overhaul agency people, but yourself."

Member of the Audience: "The Hyper-DC-3 is being sold all around the world. We are wrapping up the programs to do 167 conversions in the Far East and we have got them flying in Africa, South America, and the U. S. So far the operators are quite satisfied with the installation.

"We do have, however, another major change coming, which will improve take-off performance. For instance, the USAF is operating this equipment up on the ice caps. The change in reduction gearing will materially improve the acceleration of the aircraft. However, because of the change in the reduction gear, from 2:1 to 16:9 we are going to lose some of our cruise speed. The reduction anticipated will be 3 to 5 mph with the 16:9 gear ratio."

Member of the Audience: "What is the single engine ceiling with a new gear ratio?"

Kuhn: "Let's define single engine ceiling, so that we are all talking about the same thing. There are those of us who feel that the single engine ceiling is the level which the aircraft will seek after having drifted down from a higher altitude. The C.A.A. defines the single engine ceiling as that altitude at which you still have remaining a 100 fpm rate of climb.

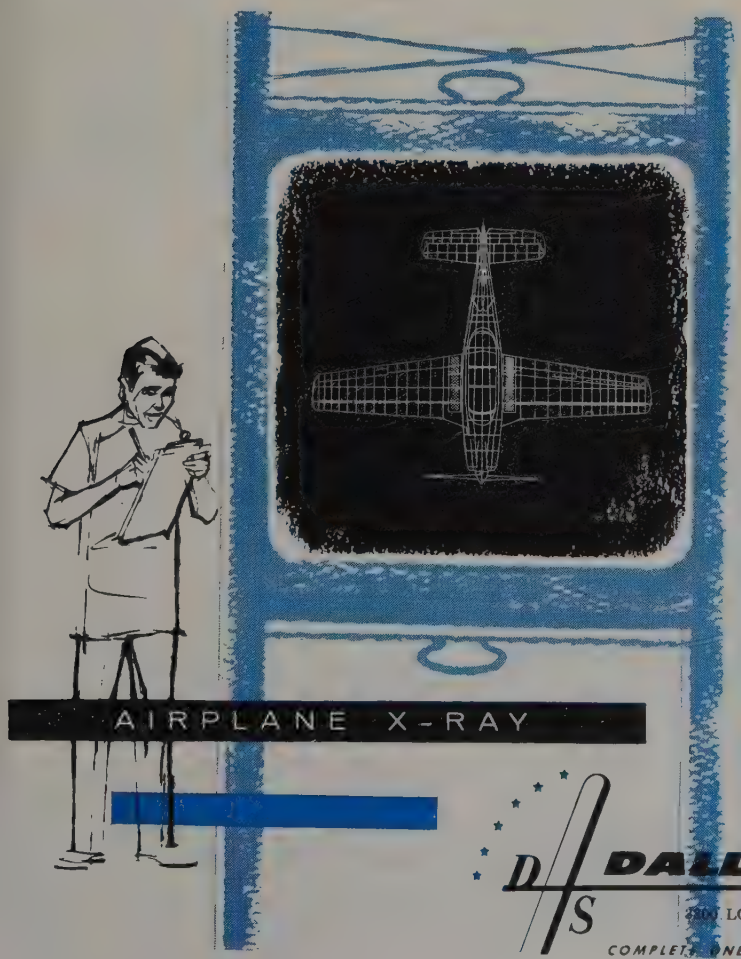
"I will quote you that particular area wherein you still will have 100' rate of climb remaining in the configuration with the D-5 installation. This is the single stage, single speed engine at maximum gross weight take-off at sea level under standard conditions and everything corrected back to standard conditions so that we have a basis for comparison. That altitude will increase from the present 12,500 to 15,000."

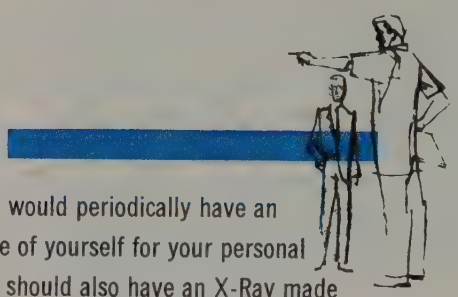
Pague: "Thank you, Art. There is another question from the audience."

Member of the Audience: "Every engine we have is the first time around. What do you consider an average time for 985's for overhaul on a Twin Beech?"

Frazee: "Eight hundred would be a very realistic and conservative time, for overhaul."

Member of the Audience: "I would like to hear the panel's views on where we draw the line on changing cylinders after a differential compression check.





Just as you would periodically have an X-Ray made of yourself for your personal health, you should also have an X-Ray made of your airplane by Dallas Aero Service.

Using the famed Portex X-Ray, Dallas Aero can periodically X-Ray your airplane—detecting and locating hidden injury and damage to the structure of the plane before the danger period arrives.

Guard the health of your airplane as you would your own—take your plane to Dallas Aero today for an X-Ray.

D/S DALLAS AERO SERVICE

2300 LOVE FIELD DRIVE • PHONE FL 2-2641
DALLAS 19, TEXAS
COMPLETE ONE-STOP SERVICE ON CONVENIENT LOVE FIELD

We have made several checks and their pressures seemed to be quite low. The engines are R-2800 and R-1830."

Frazee: "What type of compression tester were you using? There are about 9 different types."

Member of the Audience: "This is one of the personal types. We put 80 lb. in on our differential compression check and the handbook allows you to drop as much as 35 psi as far as the military is concerned.

"What do you think about some of these limits that have been set, as to how low you are allowed to go?"

Frazee: "We are not selling this particular tool—but through our own experience, we have found that the best type of tester is one made in Burlingame, Cal., that was developed by United Airlines called a 'Compair.' This is of the general type called the differential type testers. It gives you a percentage loss and you introduce any pressure, preferably somewhere between 60 and 80 lb., which is usually available at shop air, and we allow by our service bulletin #1365, a 35% compression loss when using that particular type of tester or testers of that general type.

"There is one other which is called the 'Motorstat' which the Air Force has used for years, which is of the same general variety and with which we have had some experience. The Compair we think is far more rugged and far simpler to use.

"We found that the cylinder which shows a 35% compression loss is a good cylinder. If you get the other side of that, you are starting to get into rings or valves which are getting a bit shaky, and you had better change the cylinder.

"However, in any compression tester, regardless of the results, don't believe in the first time around. If it is low, pull the rocker caps, rap the valve stem with a plastic mallet and try it again. And if after the second time you are still down, you will have to look at the cylinder."

Kuhn: "We have established the limit of 25% loss, and there was a period during our experiments with different compression testers in which we pulled many cylinders that should not have been pulled. Admittedly our 25% is a little bit lower than the flight engineering would suggest.

"We have found on certain engines an accumulation of carbon around the top rim of the cylinder barrel itself, and with the piston on top dead center, we incurred some fairly low compression checks. As you suggest, we rapped the valves. After pulling the cylinder we found that it was in good condition and that if we had moved the piston slightly away from top dead center, we would have eliminated that problem. We now make a point of moving the piston approximately ten-thousands of an inch away from the top dead center before making the final reading."

Member of the Audience: "What is the recommended overhaul time for 1830-92 in the DC-3?"

Frazee: "P&W doesn't recommend a specific 'TRO.' The average times that are being obtained by operators on 1830-powered DC-3's in airline type service, which would include executive operation, would be approximately 1300 hrs."

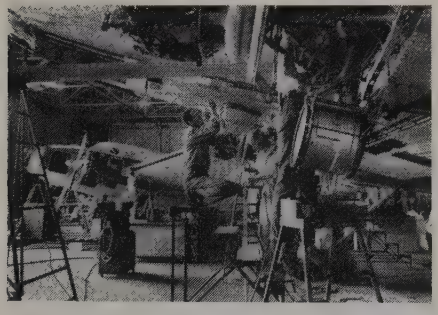
Pague: "That leads us into the question of 1830-75, super 92's and 94's and the overhaul periods for those engines."

Member of the Audience: "One of the problems you have that is quite different from airline experience, is the calendar time that it takes you to put this time on. Airlines can get away with 1300 to 1500 hrs. on their engines; it takes you a long time to put that time on, and I think from experience, it is a problem so far as the 1830-75 and -94 is concerned. The problem, of course, is with the cylinders themselves."

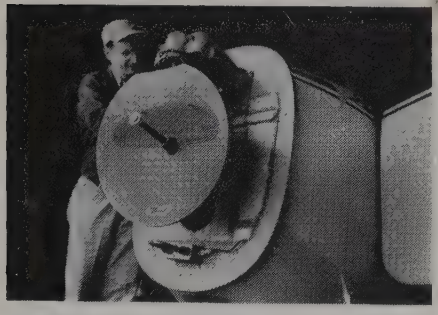
Member of the Audience: "I am told that there is an airline that runs engines 1000 hrs. in Convairs—and then they take them off, without overhaul, and stick them into DC-6's, and run them to 1800 hours."

Frazee: "No, I am sure that that isn't true. We have contact with the airlines in the U.S. and you may be thinking of an operator like United, which has one 'TBO' for Convairs at 1100 hrs. and another 'TBO' for the same type of engine in DC-6B's at 1500 to 1600 hrs."

Member of the Audience: "I would like to hear an opinion regarding the calender time versus the engine time



The facilities of Executive Aircraft are completely modern and the craftsmen are of the highest skill. Whatever is required, the job done by these craftsmen means your ship will perform more efficiently—with greater safety and comfort.



Call, wire or write

FLEET OPERATORS KNOW THEY CAN DEPEND ON EXECUTIVE AIRCRAFT SERVICE, INC.

for all operations from inspection to major modification

Whether it's a 100-hour inspection, major modification or any other major service work, fleet owners know the work done by the craftsmen of Executive Aircraft Service, Inc. is of the highest caliber. They have become accustomed to the attention to detail that means dependable and safe maintenance which is a mark of pride with these craftsmen. They have learned, too, that their planes are delivered on time from the shops of Executive Aircraft. That's why satisfied customers are our best recommendation. That's why we are now serving fleets for some of the nation's leading concerns. Why not send us your specifications for quotation or let us formulate your plans, specifications and layouts for you.

EXECUTIVE AIRCRAFT SERVICE, Inc.

Garland Airport • P. O. 7307 • Dallas, Texas • Telephone: DAvis 1-2675

between overhauls."

Frazee: "There are certain things about the engine, aside from running, on which time has an effect. The primary thing is the rubber and neoprene parts throughout the engine, for example, air/fuel diaphragms, your carburetor or your water regulator if it happens to be a 2800 CB series engine. Those parts, on the basis of time alone, according to our tests, are good for a little over 18 months.

"We had one operator recently who had a diaphragm failure. It was determined that the parts had not been looked at for over 3 yrs. If it's going to take you 3 yrs. to get 900 or 1000 hrs. on the engine, it is good sense to pull a carburetor at, say, mid-period, and to have a carburetor overhaul and a water regulator too.

"Another important thing would be to inspect the cylinder barrels for corrosion. If an engine is going to have to sit for some reason over an extended period of time, the necessary preservative precautions should be taken, such as pulling the plugs, spraying the cylinder barrels or using the Shell VP1 crystals in the combustion chamber to prevent corrosion, using the protex plugs in the spark plug holes, etc. Generally speaking, the corrosion that you do get in cylinder barrels isn't important from the standpoint of strength, but the products of corrosion are abrasive and will chew up the rings badly; a rusty cylinder will eventually be an oil burning cylinder. But the carburetor parts are the most important consideration."

Member of the Audience: "How do you feel about using detergents in the oil on the blower sludge problems?"

Frazee: "The sludge in the blower doesn't generally come from the oil; it comes from the dyes that they use to color fuel, which sometimes will precipitate out."

Member of the Audience: "The clutches, I mean."

Frazee: "You have to be careful of detergents because, depending on the base that is used, some detergents can give you loads of trouble. When they get into a combustion chamber and are burned they produce ashes, which are little insulators which will set up preignition during the combustion cycles.

"Certain of the oils that we approve do contain some detergents which, based on tests run both in the laboratories and in service, are all right.

"Actually the percentage of detergents used is very small. We cannot, because of these ashes, use the percentage of detergent that is used, for example, in automotive oils.

"Our Service Bulletin 1183 covers the list of oils that we approve. As far as clutches are concerned, the problem is not so much of the sludge precipitation out of the oil as it is in the amount of exercising that you give to the clutch.

"What particular model engine are you talking about?"

Member of the Audience: "That was in 'B' series; we have made a practice of shifting blowers at about 4 hrs."

Frazee: "The 'B' series engine was designed some 20 yrs. ago, and we have learned a lot about clutch design in the meantime. The current 2800 engine, CB, CA type clutch, is a considerably different design. Unfortunately, if you are operating a 'B' series engine, you are just going to have to live with that problem."

Cake: "There is one more thing you can do; shift every 2 hrs., not every 4. We have recommended that on even the later engines and it works."

Frazee: "Are you sure that your clutch failures have been caused by sludge? There are other problems with clutches that will keep you from shifting. What do you use for an actuator, for example?"

Member of the Audience: "We have a cable linkage to shift the valve."

Frazee: "Are you certain that the clutch is going to the full extent of its travel fore and aft every time? With that selector valve, it is possible to mid-position the thing, so that you will feed oil to both sides of the clutches at the same time and that will burn up the segments. The heat fries up the oil and it looks like a load of sludge in there. Could they possibly be something other than clutch failures?"

Member of the Audience: "We actually put tension on the cable at each end of the quadrant travel, so we know we have gone as far as we can, and there is no delay in the shift.

"We find when we take the blowers apart that there is a hard deposit in there that prevents movement. It is gray, almost like a powdered lead accumulation."

Frazee: "If it is gray, that is lead from the fuel, which has gotten into the oil and which has been precipitated out by the centrifugal force of the clutch."

Pague: "Has anyone in the audience had any experience with the new oil filters that are being applied?"

Dotter: "We have been using 2 oil filters on the -75 for the past 6 months, and to date the operation has been very satisfactory in every respect.

"We have removed from the engine a sample of oil and sent it to our manufacturing research department, where it was filtered and the deposits analyzed for foreign matter. We find that the filter is removing a certain amount of sludge from the oil, but not as much as we expected.

"That is on the -75 which operates during the summer out of Chicago, but not operating in the Southwest, where they have a serious dust problem. I rather suspect that they would do more good in a dusty section of the country than in Chicago.

"We are going to continue to use the oil filter, nevertheless."

Frazee: "We have run various service tests on filters. We find that a filter generally is not particularly successful in removing sludge, because sludge is generally precipitated out in the engine itself. It is not in the oil inlet system.

"Sludge usually comes out of your oil at the rotating areas, such as the clutches, the cage of the reduction gear, etc. However, engines run with a filter, for example the Winslow, generally show considerably less wear at overhaul. Anyone operating through a dusty area would definitely benefit by the use of a filter.

"One very dramatic example is the crop dusters who use not only oil but air filters. Winslow also makes an air inlet filter for a BT15. Where you have one engine that has been operated with the air filter system and one without, you are seeing two different engines."

Dotter: "We intend to install oil filters on our entire fleet; the fact that it does not remove a bushel basket of sludge from the oil doesn't mean that we are not satisfied with it. We are going to use it in the 985's as soon as the filter becomes available."

Pague: "What preventative maintenance would you people recommend in the case of an aircraft flying through a dust-storm?"

Frazee: "First and foremost, an oil change is indicated. However, several of the airlines, by policy and general experience, do not change oil between the length of a run; they simply add oil. They have found, in operating through the South and Mid-west, where there has been a lot of dust in the past year, that they have had to lay up an airplane that has gone through a dusty area and change oil.

"Another good preventative measure is changing spark plugs, because the silicate products of dust, when they become mixed with the lead which accumulates on the spark plugs, form a lead silicate which has very low shunt resistance and will short out."

Dotter: "We feel that the operators will take it on themselves and continue to operate between engine changes without an engine oil change."

Member of the Audience: "How often do you feel oil changes should be made under dusty conditions?"

Frazee: "We recommend an oil change at 200 hrs. The dirt accumulation which you get in oil, the acid content in the oil, the products of combustion, tend to make the oil acid over a period of time and this acid, in time, will have an effect on the leaded bearings throughout the engine.

"Most of the airlines do not change the oil, they simply add it. But their engines are only in service for about 6 mo., and their cycle average is about once every 6 mo. The time factor would have an effect.

"Perhaps you would want to make up your own mind as to what your best oil change periods were and sample your oil at each 100 hrs., send it to a local lab for an acidity check, and get the acid content to stay down reasonably low."

Member of the Audience: "We are service testing filters on at least 3 installations with time to 3000 hrs. What the final analysis on the filter installation is, I am not sure of at this time.

"I do know that there was considerable interest in it. I have heard fabulous figures about the amount of sludge

AIR LINE PILOTS

Eastern Air Lines' 425 million dollar expansion program including turbo-prop and straight jets requires additional pilots.

Eastern Air Lines offers you—

- Security for yourself and family
- Opportunity for advancement
- Excellent pay
- Broad insurance coverage
- Many other excellent employee benefits

To qualify for consideration—

- U. S. citizen
- High school graduate
- Age 21-30 (Will consider men up to age 32 if have 1500 hours or more)
- 5'8" (without shoes) to 6'4" in height
- 20/20 vision without use of glasses or contact lens
- At least 400 hours certified pilot time
- Must have CAA Commercial License—prefer current instrument rating

For current and future openings, write immediately detailing personal qualifications, work experience and flight time to:

Capt. F. B. Kern,
Chief of Pilot Training
Eastern Air Lines
Box 787, Miami 48, Florida

ENGINEERING DEGREE IN 27 MONTHS

B.S. Degree. Aero., Chem., Civil, Elec., Mech., & Electronic Eng. (inc. Radio & TV) B.S. degree in 36 mo. in Math., Chem., Physics. Preparatory courses. Low rate. Earn board. G.I. approved. Enter June, Sept., Dec., Mar. Catalog. 257 E. Washington Blvd., Fort Wayne 2, Indiana.

INDIANA TECHNICAL COLLEGE

that the filter removed from that engine. However, I am sure that the situation has changed since that time, and that those figures are improved considerably.

"This, as you well know, is a very large engine, the R4360, and the filters that we are using were not as large as should be used on that engine; therefore, it was necessary to change the filter in it rather frequently.

"I know that the company is quite interested in filters and that it is planning to continue this experiment hoping to come up with a satisfactory filter for all engines."

Pague: "Thank you. May we have just a brief discussion on the oil dilution matter?"

Cake: "Oil dilution is fine if you use it correctly. It will give you a lot of trouble if you don't. And the correct use of it is laid out in certain Air Force and Navy publications. It is shown in the 2-1-15 tech. order.

"The main thing to remember is that when you operate these engines they get filled up with sludge inside. When you put fuel into the oil, the fuel tends to break that sludge away from the surfaces, so that the Air Force has set up periods within which you can dilute the oil for cleanliness alone.

"You can dilute the oil and then, completing the dilution, clean all the screens and remove all the oil—do whatever is necessary to keep the sludge from staying in the engine.

"Now, in cold weather operation, you will probably have to dilute every day, or at least, you could have to dilute after every flight, if you weren't going to use the aeroplane within an hour or so.

"In that case you should have no trouble, providing you know what percentage of that oil is fuel; providing you know that your oil system is set up to do this properly and providing you do it consistently.

"Now, if I remember correctly, the Air Force tech. order calls for 50 hrs. between dilutions. You are taking something of a chance by diluting at the end of 100 hrs., unless you do it in a very careful fashion, which means diluting it properly—immediately taking out the screens, taking all of the oil out of the system and starting over again with clean oil, because the engine sludge will get into the system and will harm the engine considerably."

Member of the Audience: "You mean *the first dilution of the season is the critical one?*"

Cake: "That is the critical one; that is right. After you have gotten your engine cleaned up by the first dilution, and then you do it regularly after that, and do it knowing that it has the proper fuel to oil percentages, then you should have no real difficulty and it should make a better, cleaner engine."

Pague: "After the first dilution, at what periods would you say you should redilute?"

Cake: "We suggest a period of no less than about 25 hrs. Actually, you can go to 50 hrs., but if you do that, you will then have to go through the major steps all over again.

"You still have to watch your screens and your system as a whole. That is why I say you have to do this thing knowingly, otherwise you can get into real trouble."

Member of the Audience: "In the matter of carburetor heat, I understand that several years ago Chicago and Southern ran extensive tests to determine, at temperatures below plus 40° Centigrade, that there is a chemical reaction which takes place due to the coldness of the air; therefore, they never run their engines at below the temperature of plus 20°C."

Cake: "Actually the use of carburetor heat is for two reasons. You use it to prevent ice and to provide better fuel/air distribution within the engine. On our single row engines, we don't have as good distribution as we do on the other engines which have the impeller injection system of getting the fuel into the air, so that on our single row engines, we say you should hold 90° Fahrenheit.

"On the Beech airplane you have a mixture temperature gauge and there is a real difference. You get a drop of beween 30° and 60°F as the fuel is vaporized in it, so that on the Beech you would normally hold between 15° and 20°C mixture temperature, and that, translated back into your carburetor air temperature, which is the thing we are interested in principally, should give you good vaporization of the fuel in the airstream and should keep you away from ice.

"The bigger, later engines don't really need any carburetor heat most of the time. On the 2800 CA CB series, there have been some icing tests run specifically to find out how they did operate, and we feel that on the bigger engines the problem is not one of icing of the airstream that it is cutting down manifold pressure as the ice builds up, but the cutting off of fuel flow, which results when the ice gets in the air passages in the carburetor and stops them up."

Member of the Audience: "Actually, I was thinking of oil contamination or injury to the engine because of the supposed acid forming,"

Cake: "There is no connection between the two as far as I know except that when you run very cold air into the carburetor, you don't get adequate vaporization of the fuel, which washes down the cylinder walls."

John Lessner (*Hamilton*): "I would just like to add that if you are going to use reversing propellers, reverse them fast so that you get the most out of them. Reversing is a good thing when the speed is high, but don't do it when you're in the air.

"Secondly, if you have an airplane without tricycle gear, you may run into a stability problem. You will get asymmetric thrust no matter how good you are, so that you must be careful to keep your plane heading in the right direction.

"Thirdly, airplanes without nose wheels are somewhat prone to nose over with the application of reverse power, because the CG is normally above the line of thrust, so that the airplane wants to go forward while the propellers are pushing backward."

Pague: "Certainly this meeting has assured us that we are going to have adequate engines and parts from Pratt & Whitney for at least 15 yrs. in the future. I want to thank everyone, particularly the panel members, for this informative discussion."

Arizona's Airport
TUCSON

INTERIORS
HORTON-HORTON
EXCLUSIVELY
Meacham Field Fort Worth

Aircraft Division
AIRMAR RADIO SERVICE, INC.
CAA APPROVED REPAIR STATION #3598
RADIO CLASS 1 & 2
DESIGNERS AND MANUFACTURERS OF CUSTOM AIRCRAFT
Radio and Radar Systems
MACARTHUR AIRPORT
RONKONKOMA, L. I., N. Y.

EXECUTIVE DC-3
For Sale
Truly Beautiful
Executive Interior
Attractive Paint Job—
Recent 12000 Hour Overhaul—
All Set To Put Into Operation
PAGE AIRWAYS, INC.
Rochester Airport
Rochester, New York
GEnesee 8-7301

Mechanics of the Landing Camera

(Continued from page 14)

maintained on an acceptable approach light pattern with a minimum visual segment that is the equivalent of 3 seconds of time at the aircraft's forward velocity, the requirement increases to 6-9 seconds over the runway because there is no continuity of the visual intelligence, obtainable in the approach zone, onto the runway.

The pilot has visual guidance over the approach, then it deteriorates or becomes entirely absent over the runway in the critical portion of landing. With the little he can see, illusions can develop in a fast-moving dynamic picture that is incomplete, and the result is confusion and inevitably trouble. The few seconds available are insufficient to reconcile visually the required necessary judgments with the associated finesse.

For our purpose we can consider the brain as the computer that takes the visual information that is fed to it, analyzes it and then sends the appropriate muscle pulse for the required action, plus storing it in the memory circuit for a period of time.

This is strictly a rudimentary analysis. However, by applying the simple mechanics of the eye, plus experience in the Approach and Landing problem, one can distinguish and isolate the various portions of the problem and arrive at reasonable solutions:

1. The area of foveal vision has a spread of 3° plus .2° −.5°.

2. This area of sharp clear vision is less than 5% of the normal visual field.

3. Considering only the visual portion of a low visibility approach, the pilot while over the approach zone does some scanning with the eyes and as the threshold is approached, the attention is concentrated directly ahead.

4. Upon crossing the threshold (under low visibility conditions and with present runway lighting standards) there is no visual assistance in his foveal vision field. Research has proven that the pilot's eyes in this portion of flight stare directly ahead. Under normal visibilities he is using both foveal and parafoveal vision at this point, but under low visibility his visual cues are extremely weak in the present runway treatment. This is further aggravated by the fact that in a stare condition foveal vision deteriorates for having no focal point. (On test work with 3 and 4 pairs of trained eyes in the cockpit, one person would see certain lights and objects and another would not, and vice versa.)

5. The proposed Elfaka flush type runway lighting configuration will provide visual aid in the foveal visual field down to visual ranges of less than 1200′. In visual ranges of less than 1200′ down to the lowest operational range, it will provide strong and adequate signals in the parafoveal visual field and leave a dark spot for foveal vision fixation.

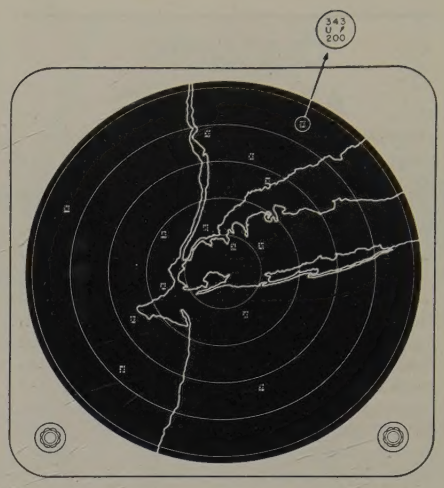
Data Link

(Continued from page 21)

and machine processing.

Development work is under way on a vastly simplified version. It weighs approximately 13 lb. and occupies a volume of about 1/5 cu. ft. It is completely transistorized and designed for environmental requirements of modern high-speed aircraft.

One of the displays adopted to the TACAN Data Link that is of particular interest for air traffic control is illustrated in *Fig. 4.* The outputs of the Storage Unit are assembled on a symbolic display where each aircarft is represented by a group of letters and numbers. A number of aircraft reports are displayed. The one circled represents United Flight 343, located over Conn., heading NE at an altitude of 20,000′. A spare character is provided for display of speed if desired. By means of this type of display, a convenient and easily filtered over-all situation can be presented, showing either all aircraft in an area, or given types of aircraft, given altitude layers, etc.



SYMBOLIC DISPLAY

FTL does not make clear whether or not their VORTAC equipment, unlike their TACAN equipment, makes any provision for integrated simultaneous use for communications as with standard VOR equipment today. This could be related to the CAA's proposal to change CAR Part 43 to require separate navigations and communications radios for all IFR flight!

Jump Seat

(Continued from page 43)

lunches by Cadillac limousine, liveried chauffeur and purple regimental pennants flying full staff from the front fenders. Paul Kilborn at the Langwell in Elmira (home, that is) heard about it so the next time he catered for us, he sent his raunchy old ranch wagon out with a hotel face towel flapping from the aerial.

Washington

The big Marriott Motel sent us all a brochure when they opened. So effective was the response, that we couldn't get a sack there the first time we hit Washington. Joe Clemow, Chief Pilot for Eastman Kodak, got in though (by threatening to cut out the Brownie concession in the lobby), and *he* sez that the place is large and very well done. So even though we prefer ours small and rare, we will give them another crack at our business. Suggest advance reservations at DCA. Thing is to find *your industry's* lobbyist and make *him* produce.

See you next month.

P.S. No, I do not write under the pseudonym "Roger Wilco."

CLASSIFIED ADVERTISING

Rates for Undisplayed Classified Advertising: 30¢ per word, minimum charge first 10 words $3.00, prepaid with order. Add 4 words if Box Number is included in lieu of advertiser's name and address.

AERONAUTICAL BOOKS

FREE CATALOG (1957) of leading aviation supplies including Zweng Books, Navigation Computers, Plotters, Log Books, etc. Also maps and charts; Books of the Sea and Air. Nautical supplies and general technical books on all subjects. Pan American Navigation Service, 12021-22 Venture Blvd., N. Hollywood, Calif.

STICK AND RUDDER, the famous guide to art of flying, by Wolfgang Langewiesche, is available at better bookstores or direct from McGraw-Hill, 330 West 42nd Street, N.Y.C. 36. Still only $5.50.

CHARTS & MAPS

AVIATION Charts now available from our new Chart Division. Agents for the Coast and Geodetic Survey. Our service includes Aeronautical Sectional, World Aeronautical, Direction Finding Navigational Flight, etc. Distributors for New Plastic Relief Map of the United States $45.00 express prepaid. (Free Catalog.) Pan American Navigation Service, 12021-22 Venture Blvd., Hollywood, Calif.

MISCELLANEOUS

$2.00 can save you hundreds. It's NEW! ! ! Now you can receive information each month on hundreds of aircraft for sale throughout the United States. At a glance you will know what is available, hours, date licensed, price, etc., of practically every type of airplane manufactured. We tell you who owns the aircraft and you deal direct, saving time, eliminating hours of travel, and by knowing the market you get the best deal possible. You can receive your first copy listing aircraft for sale IMMEDIATELY DON'T WAIT!! Send $2.00 TODAY for a full year's subscription. Flyer's Market published by Aircraft Listing Bureau, 5306 Congress St., Chicago 16, Ill.

HENRY PUBLISHING CO.,
122 East 42nd St., New York 17, N.Y.

Gentlemen:

Please send me SKYWAYS for

☐ **1 yr. @ $4.00** ☐ **2 yrs. @ $7.00**

☐ **Bill me** ☐ **Check enclosed**

Name _____

Address _____

City _____ **Zone** _____ **State** _____

Company name _____

Title _____

Pilot License # _____

Navicom

(Continued from page 24)

Results of Mar. 21 Airspace Meeting

There are several VOR Radio Range stations which have been approved by Washington as well as Regional Airspace Sub-Committee: Casa Grande, Ariz., San Simon, Ariz., Deming, N.M. No date has been set for commissioning.

The approved Victor Airway from Deming, N.M. to Newman, Tex. was also approved but will be implemented when the VOR Radio Range stations are in operation.

A proposed installation of a VOR Radio Range station at Alamosa, Col. was approved at the Regional Airspace Sub-Committee meeting. It should be noted that this facility is good for navigation but not designed for instrument approaches. It will have to be approved by Washington.

The proposed VOR Radio Range station at Chinle, Ariz., was turned down by the members of the Defense Dept. which necessitates the proposal going to Washington for further study and dispensation.

There is a study going on which will cause the L/MF Radio Range station "SRA" at Los Angeles to be discontinued and converted to a 400 watt "H" facility to be used as both a Homer and Voice for weather broadcasts.

The Army proposed to establish an airport at Fort Ord, Cal. The proposal was withdrawn as a reflection of the objections of members of Salinas Airport and Monterey Peninsula Airport authorities.

Monterey Peninsula Airport reported 1046 Instrument Approaches and 620 Instrument Departures in 1955.

In 1956: 1608 Instrument Approaches; 956 Instrument Departures. A new ILS system has been installed and flight checked. Monterey officials anticipate a 50% increase in instrument traffic in the coming year.

Rescission of Amber 8 and Blue 52 between Santa Barbara, Cal. and Fresno, Cal. was approved and will be implemented soon.

A relocation of SFO VOR Radio Range station is being studied due to traffic requirements.

Proposed transcontinental Victor Airway segement from Daggett, Cal. to Pueblo, Col. was rejected by members of the Defense Dept. It will have to go to Washington for discussion.

Two VOR Radio Range stations on that route at Valle, Ariz., and Farmington, N.M. have been installed and flight checked. They were commissioned Apr. 20, '57.

Wakmann 8-Day Aviation Clock

The Wakmann Watch Co., Inc. announces that they are releasing to the commercial aviation industry Model

640-24, an 8 day elapsed time aircraft clock with a 24 hour dial, manufactured, tested and regulated in accordance with MIL-C-9196 (USAF).

This new clock, known as Type A-10A, has a precision movement which records time of trip, with independent stopping device. Model 640-24 fits standard panel opening, has a 2¾" dial, 24 hour dial with center chronographic sweep second, upper hour register. Matte white markings on black background, lightweight unbreakable oxidized aluminum case.

Left side button (at 8 o'clock positon) sets and winds this clock while the right side button (4 o'clock position) controls the sweep second and lower 60 minute register. Center lever controls upper hour register which provides for time-out, and acts independently of the sweep second.

Air Your Views

(Continued from page 6)

noticed that my engine was dead. I was ready to bail out when I saw the landing strips and decided to try to set her down. If I had known the strips were only 4000' long I would have bailed out."

Capt. Walsh came in over the obstructions on the S. end of the field with gear and dive brake down. After passing the obstructions he opened the drag chute. He touched down about 100' from the end of the concrete, started using his brakes, and got the plane stopped on the N. end of the runway, with not much room to spare. After he got out of the ship he decided the engine had frozen up.

Col. J. C. Haygood arrived from Bunker Hill, along with the Air Police to guard the plane, and representatives from North American and Pratt & Whitney. The colonel decided to change the engine here and fly the plane out.

A C-119 piloted by Capt. J. J. Ford and Capt. J. R. Komp brought in equipment and maintenance personnel. Lt. J. Wagner, 345th Ftr. Bomber Sq., Maintenance Officer, was in charge of the operation. They changed the engine in our maintenance hangar, which is 50' x 80', just big enough to work on the F-100. The crew worked all Fri. night and all day Sat.

On Sun. afternoon Col. Haygood climbed into the plane, taxied out to the runway, hit the afterburner and was airborne in less than 2600'.

The American taxpayer should really compliment Capt. Walsh on his superb landing of that jet. His judgment and flying ability saved us about a million dollars.

Wm. C. Britt, Danville, Ill.